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# Relationships between Increasing Outpatient Encounters for Neurological Disorders and Introductions of Associated Diagnostic Codes, Active Duty Military Service Members, 1998-2010

Previous surveillance summaries of administrative data have indicated increases in the incidence and health care burdens of neurological disorders among active component U.S. military members during the last decade. Seventy-eight percent of the increase in average annual numbers of neurological disorders-related outpatient encounters during 2005-2010 is attributable to new diagnostic codes for three common conditions--sleep disorders, pain, and headache. The new codes were added to the International Classification of Diseases as "diseases of the nervous system" between 2005 and 2008. The pre-existing codes for these conditions are in most cases not classified as neurological. Visits for "organic sleep disorders" in particular represented nearly one-half of all outpatient encounters for neurological disorders in 2010. The use of the new diagnostic codes by healthcare providers can mask trends of the "true incidence" of illnesses and injuries and should be considered when interpreting surveillance analyses.

The Defense Medical Surveillance System (DMSS) is an administrative data set and executive information system maintained by the Armed Forces Health Surveillance Center (AFHSC). DMSS captures diagnoses that are recorded during health care encounters (outpatient visits and hospitalizations) of U.S. military members in military treatment facilities and in civilian sources of care funded by the Department of Defense (DoD). Such diagnoses are documented and reported using codes that are specified in the International Classification of Diseases, 9<sup>th</sup> Revision (ICD-9). ICD-9 coded diagnoses are used to conduct epidemiologic studies of diseases and injuries that affect beneficiaries of the Military Health System (MHS) and to monitor preventive health services that are delivered to them.

Previous surveillance analyses have indicated that the incidence and health care burdens of neurological disorders (ICD-9 codes 320-359) among active component members of the U.S. military have risen dramatically during the last decade. This report summarizes results of analyses of factors associated with increasing health care encounters for and new (first time per person) diagnoses of conditions categorized in the ICD-9 as "Diseases of the Nervous System".

In addition, this analysis assesses relationships between increases in diagnoses of neurological disorders overall and introductions of new neurological disorder-related ICD-9 diagnostic codes. Of note in this regard, of 160 new "Diseases of the Nervous System"-related codes that were introduced between 1998 and 2010, 75 are encompassed within three 3-digit level codes that were recently added to the ICD-9: 327 "organic sleep disorders", 338 "pain, not elsewhere classified", and 339 "other headache syndromes". These three 3-digit ICD-9 codes include relatively common conditions that were previously not classified in the ICD-9 as "Diseases of the Nervous System".

## METHODS

The surveillance period encompassed the 13 years from 1 January 1998 through 31 December 2010. The population included all members of the active component of the U.S. Armed Forces who served any time on active duty during the surveillance period. Outcomes of interest were all outpatient encounters for which a diagnosis of a neurological disorder was recorded in the first diagnostic position.

Neurological disorders were defined as conditions that were documented within any of the 38 three-digit level ICD-9 codes in the range 320-359 inclusive. In addition to tallying the total outpatient visits with neurological disorders recorded as primary (first-listed) diagnoses, the numbers of incident (first per person) diagnoses of various disorders were estimated. Incident cases were defined as individuals who had two outpatient encounters, at least 7 days apart, in which the same three-digit ICD-9 code was recorded. The incidence date was the date of the first of two such defining encounters. Counts and trends of both total encounters and incident diagnoses were determined for the entire surveillance period. For each disorder (as documented with a 3-digit level ICD-9 code), an individual could be counted as an incident case only once during the surveillance period. However, individuals could be counted as incident cases of multiple three-digit level defined disorders during the period.

## RESULTS

During the surveillance period, the annual number of outpatient encounters associated with diagnoses of neurological disorders in the first diagnostic position rose steadily from 1998 (67,685 visits) through 2004 (102,617 visits). In 2005, the number of visits decreased slightly (96,281 visits), but from 2006 (126,909 visits) through 2010 (413,349 visits), annual visits sharply increased (**Figure 1**). Similarly, annual numbers of incident neurological disorder cases were fairly stable from 1998 through 2005 and dramatically increased through the remainder of the period (**Figure 1**).

During the 13-year surveillance period, there were 2,004,537 outpatient encounters for the 38 neurological disorders considered here; more than three-fourths (78.5%; n=1,574,109) of the encounters

**TABLE 1.** Outpatient encounters and incident cases of “diseases of the nervous system”, comparison of the periods 1998-2004 and 2005-2010, active component, U.S. Armed Forces, 2001-2010

	1998-2004 (7 years)		2005-2010 (6 years)		Increase between the periods	
	No. encounters	No. incident cases	No. encounters	No. incident cases	% increase, encounters	% increase, incident cases
<i>Total encounters/incident cases</i>						
All neurological disorders	613,183	98,881	1,391,354	196,023		
Six most frequently reported diagnoses	429,659	75,069	1,144,450	168,225		
All other diagnoses (n=32)	183,524	23,812	246,904	27,798		
<i>Average annual encounters/incident cases</i>						
All neurological disorders	87,598	14,126	231,892	32,671		
Six most frequently reported diagnoses	61,380	10,724	190,742	28,038	89.7	93.4
All other diagnoses (n=32)	26,218	3,402	41,151	4,633	10.3	6.6
<i>Average annual encounters/incident cases, most frequently diagnosed disorders</i>						
Organic sleep disorders (ICD-9 327)	0	0	83,608	12,410	57.9	66.9
Pain, not elsewhere classified (ICD-9 338)	0	0	18,027	2,576	12.5	13.9
Migraine (ICD-9 346)	33,402	6177	46,618	6,285	9.2	0.6
Other headache syndromes (ICD-9 339)	0	0	11,506	2,192	8.0	11.8
Mononeuritis lower limb, unspecified site (ICD-9 355)	6,987	1146	9,729	1,482	1.9	1.8
Mononeuritis upper limb, monon. multiplex (ICD-9 354)	20,990	3400	21,255	3,093	0.2	-1.7

were attributable to six 3-digit level ICD-9 diagnoses: ICD-9 346 “migraine” (25.6% of the total), ICD-9 327 “organic sleep disorders” (25.0%), ICD-9 354 “mononeuritis of upper limb and mononeuritis multiplex” (13.7%), ICD-9 338 “pain, not elsewhere classified” (5.4%), ICD-9 355 “mononeuritis of lower limb and unspecified site” (5.4%), and ICD-9 339 “other headache syndromes” (3.4%) (**Figure 2**).

From 1998-2010, there were 294,904 incident diagnoses of neurological disorders during outpatient encounters. More than four-fifths (82.5%) of the incident diagnoses were attributable to the six 3-digit level ICD-9 defined disorders that accounted for the most neurological disorder-related outpatient encounters overall (**Figure 2**).

Trends of annual visits and incident diagnoses of neurological disorders changed dramatically after 2005 (**Figures 1,2**). The sharply increasing counts overall after 2005 were mostly attributable to increases in four of the six 3-digit level ICD-9-defined diagnoses cited above; of note, three of the ICD-9 codes that specified these diagnoses were not added to the

ICD-9 coding system until October 2005 (327), October 2006 (338), and October 2008 (339). Prior to those dates, diagnoses for sleep disorders, pain not elsewhere classified, and other headache syndromes were generally documented with ICD-9 codes that were not included in the major diagnostic category of “Diseases of the Nervous System.”

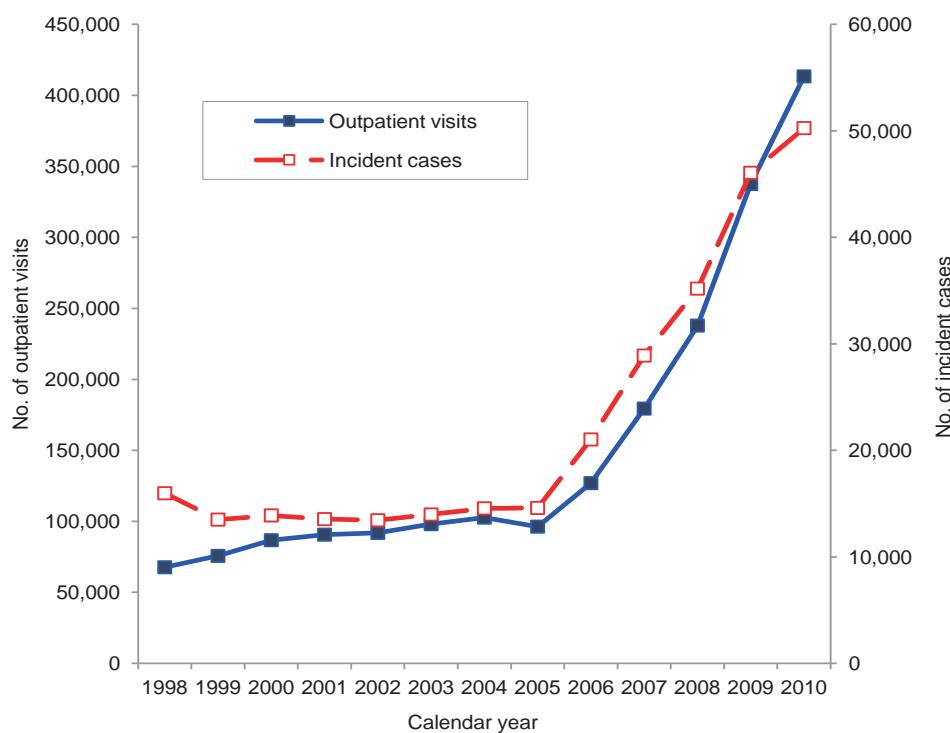
During the seven-year period from 1998 to 2004, the average of annual outpatient encounters for neurological disorders was 87,598; during the subsequent six years, the average of annual outpatient encounters for neurological disorders was 231,892. From before to after 2005, the six most frequently diagnosed neurological disorders overall accounted for approximately 90% of the increase in the average number of neurological disorder-related encounters and more than 90% of the increase in incident neurological disorder diagnoses (**Table 1**).

Of note, of the six most frequently diagnosed neurological conditions overall, ICD-9 codes 354 “mononeuritis of the upper limb and mononeuritis multiplex” and 355 “mononeuritis of the lower

limb and unspecified site” made only small or no contributions to the large overall increases in total encounters for and incident diagnoses of neurological disorders. In fact, the average annual incidence of the former diagnosis (ICD-9: 354) declined during the last six years of the surveillance period. Also, while diagnoses of migraine (ICD-9: 346) accounted for 9% of the increase in the average annual number of encounters for neurological disorders, the average annual incidence of migraine diagnoses increased by less than one percent after 2005.

Of the six most frequently diagnosed neurological conditions overall, four (ICD-9 codes 327, 338, 339, and 346) accounted for nearly all of the increases in the average numbers of encounters (87.6%) and incident cases (93.2%) after 2005 (**Table 1**). Of particular note in this regard, the three neurological disorder-specific ICD-9 codes that were newly introduced between 2005 and 2008 accounted for 78.4% and 92.6% of the overall increases in the average annual numbers of outpatient encounters for and incident diagnoses of neurological disorders, respectively, after 2005 (**Table 1**).

**FIGURE 1.** Outpatient visits and incident cases of “diseases of the nervous system”, (ICD-9-CM: 320-359), by year, active component, U.S. Armed Forces, 1998-2010



## Organic sleep disorders

During the 13-year surveillance period, 501,653 outpatient encounters were reported with ICD-9 327 “organic sleep disorders” as the primary (first-listed) diagnosis. Although nearly all of these encounters took place after 1 October 2005, they represented 25% of all encounters for neurological disorders during the entire period and nearly one-half (46%) of all encounters for neurological disorders in 2010. Among the 73,727 service members who had more than one encounter for organic sleep disorders during the surveillance period, the average number of encounters for this diagnosis was 6.4. Analyses of specific diagnoses (ICD-9 327.xx) classified under ICD-9 327 “organic sleep disorders” revealed that 472,911 (94.3%) of all such encounters were associated with ICD-9 327.23 “obstructive sleep apnea”. Of the 69,047 individuals with more than one encounter for “obstructive sleep apnea,” the average number of encounters was 6.5.

Prior to the introduction of ICD-9 327 in 2005, diagnoses of obstructive sleep apnea (ICD-9 327.23) would have been coded as ICD-9 780.57 “unspecified sleep

apnea.” The “old” code is still valid and classified under the major diagnostic category of “Signs, Symptoms and Ill-Defined Conditions”; as such, encounters that are documented with this diagnostic code are not considered neurological disorder-related encounters for routine surveillance purposes. Numbers of encounters documented with ICD-9 780.57 “unspecified sleep apnea” increased steadily from 1998 to a peak in 2006 and have been fairly stable since then. Of the 50,349 service members with more than one encounter for ICD-9 780.57 “unspecified sleep apnea”, the average number of encounters for this diagnosis was 4.4.

## Pain, not elsewhere classified

During the 13-year surveillance period, 108,159 outpatient encounters were reported with ICD-9 338 “pain, not elsewhere classified” as the primary (first-listed) diagnosis. Although nearly all of these encounters took place after 1 October 2006, they represented 5% of all encounters for neurological disorders throughout the surveillance period and 10% of all encounters for neurological disorders in

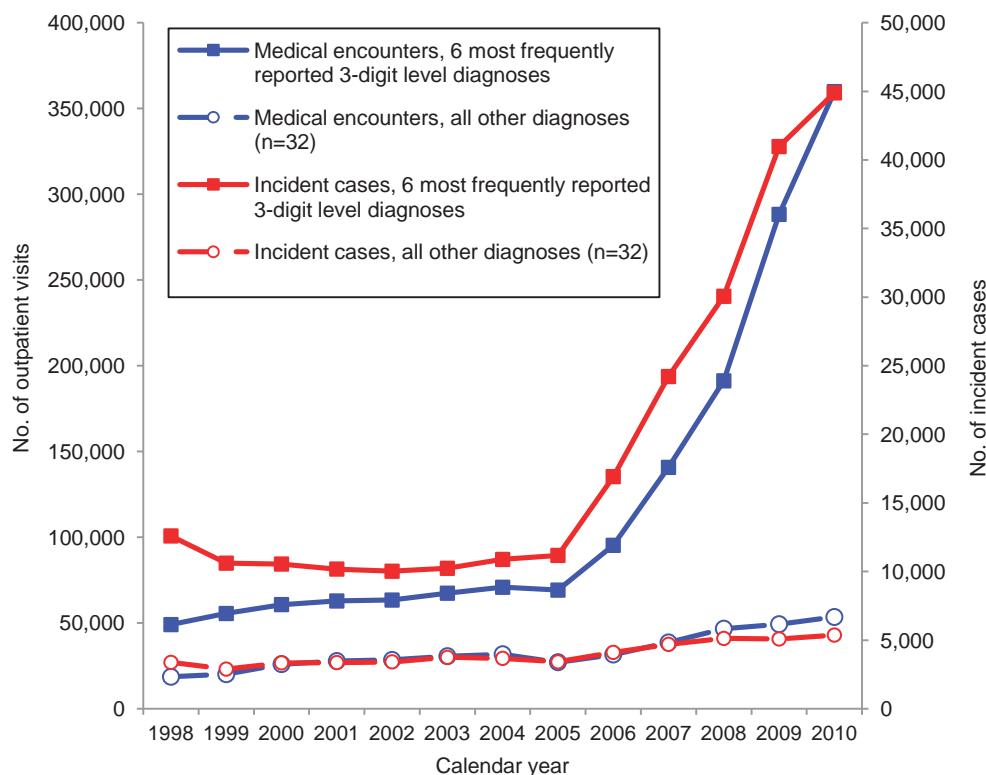
2010. Among the 15,604 service members with more than one encounter for “pain, not elsewhere classified”, the average number of encounters for this diagnosis was 4.9. Analyses of specific diagnoses (ICD 338.xx) classified under ICD-9 338 “pain, not elsewhere classified” revealed that 88,299 (82%) of all such encounters were associated with ICD-9 codes 338.29 “other chronic pain” (37%), 338.4 “chronic pain syndrome” (24%), and 338.18 “other acute postoperative pain” (21%).

Prior to the introduction of ICD-9 338 in 2006, diagnoses of pain were documented with a variety of codes according to the location, organ system, or presumed etiology. These codes are still valid and contained within the ICD-9 major diagnostic categories pertaining to Mental Disorders, Nervous System, Sense Organs, Circulatory System, Digestive System, Genitourinary System, Musculoskeletal System, and Symptoms, Signs, and Ill-Defined Conditions. During the surveillance period, the numbers of encounters associated with these diverse pain-related ICD-9 codes far outnumbered those documented with ICD-9 338, remained relatively stable until 2005, and rose steadily after 2006 (the year that ICD-9 338 was introduced). Most of the increase in encounters documented with the “old” pain-related diagnostic codes were attributable to increases in reports of ICD-9 719.4 “pain in joint” and ICD-9 729.5 “pain in limb” as well as ICD-9 724.1 “pain in thoracic spine”, ICD-9 724.2 “lumbago”, and ICD-9 724.5 “backache, unspecified” (Figure 3). More than 97% of the encounters for which older pain codes were used were attributable to the musculoskeletal system (90.7%) or to unspecified or other chest pain (6.5%). Despite the trend of increasing encounters associated with pain-related diagnostic codes (old and new) overall, incident pain-related diagnoses overall declined or remained relatively stable during the surveillance period (Figure 4).

## Other headache syndromes

During the 13-year surveillance period, 69,037 outpatient encounters were reported with ICD-9 339 “other headache syndromes” as the primary (first-listed)

**FIGURE 2.** Outpatient visits and incident cases of “diseases of the nervous system”, (ICD-9-CM: 320-359), by year, active component, U.S. Armed Forces, 1998-2010



diagnosis. Although nearly all of these encounters took place after 1 October 2008, they represented 3.4% of all encounters for neurological disorders during the surveillance period and 8.7% of all encounters for neurological disorders in 2010. Among the 12,603 service members with more than one encounter for “other headache syndromes”, the average number of encounters for this diagnosis was 3.7. Analyses of specific diagnoses (ICD-9 339.xx) classified under ICD-9 339 “other headache syndromes” revealed that 64,611 (94%) of all such encounters were associated with ICD-9 339.89 “other specified headache syndromes” (70%), ICD-9 339.20-339.22 “post-traumatic headaches, unspecified, acute, or chronic” (12%), or ICD-9 339.10-339.12 “tension headaches, unspecified, episodic, or chronic” (12%).

Prior to the introduction of ICD-9 code 339 in 2008, diagnoses of headache were documented with the following codes: ICD-9 307.81 “tension headache”; ICD-9 310.2 “postconcussion syndrome”; ICD-9 346.20-346.21 “variants of migraine, not elsewhere classified, without mention of status migrainosus”; ICD-9 346.90-346.91

“migraine unspecified, with or without mention of intractable migraine or status migrainosus”; or ICD-9 784.0 “headache”. These codes are still valid and classified within the major diagnostic categories pertaining to Mental Disorders, Nervous System, and Symptoms, Signs, and Ill-Defined Conditions. During the surveillance period, the numbers of encounters documented with these older headache-related ICD-9 codes were relatively stable until 2006, rose steadily in 2007 and 2008, and decreased in 2009 and 2010 (after ICD-9 339 was introduced). Most of the recent decrease in encounters documented with older headache-related codes was due to decreases in diagnoses reported as ICD-9 784.0 “headache”, ICD-9 307.81 “tension headache”, and ICD-9 310.2 “postconcussion syndrome”. More than 96% of the encounters for which the older headache-related codes were used were attributable to ICD-9 784.0 “headache” (58% of total), ICD-9 346.90 “migraine unspecified without mention of intractable migraine or status migrainosus” (25%), ICD-9 307.81 “tension headache” (7%), and ICD-9 310.2 “postconcussion syndrome” (7%).

## Other diagnoses

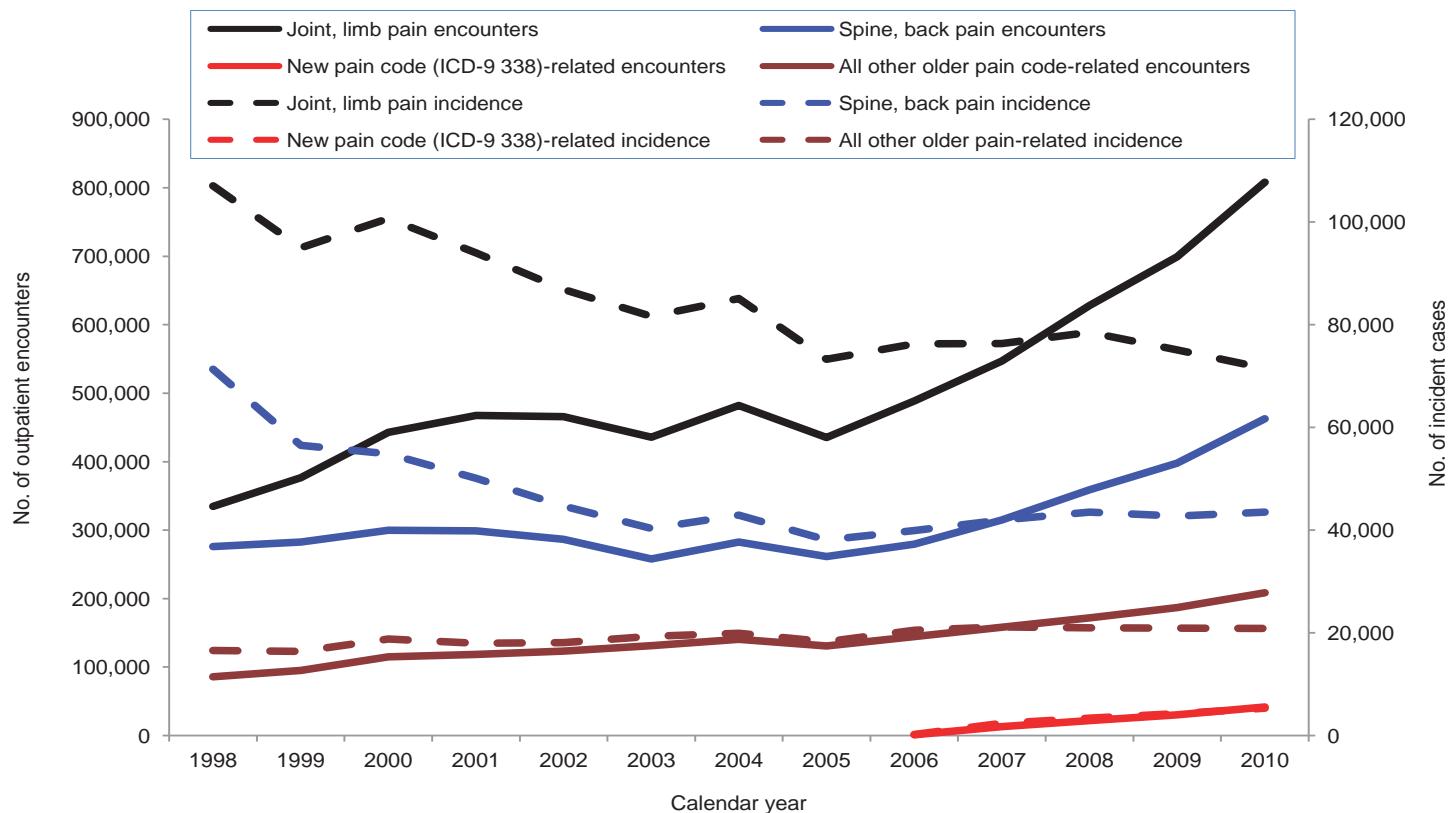
The analyses conducted for this report focused on the six most frequently reported (of 38) three-digit level diagnoses included within the ICD-9 major diagnostic category of Diseases of the Nervous System. The 32 other diagnoses in the category accounted for just 21.5% of all encounters and 17.5% of all incident cases of neurological disorders during the surveillance period. During the period, the average annual number of encounters documented with the 32 less frequently reported neurological disorder-related diagnoses increased by 57%; in contrast, the increase of encounters documented with the six most frequently reported 3-digit level codes was 210%. Similarly, the average annual number of incident cases increased 36% for the 32 relatively infrequently reported codes and 161% for the six most frequently reported codes. Of note, during the surveillance period, 55 new ICD-9 codes were introduced to supplement the codes that have been used to document the 32 less frequently reported neurological disorders. This analysis did not assess associations between introductions of these new diagnostic codes and increases in encounters for and incident diagnoses of these less frequently diagnosed conditions.

## EDITORIAL COMMENT

The preponderance of the increase in recorded diagnoses of “neurological disorders” in outpatient encounters since 2005 is attributable to the growing use by health care providers of three new 3-digit level ICD-9 codes introduced in the autumns of 2005, 2006, and 2008, respectively. Each of the new codes is associated with a common clinical entity: sleep disorders, pain, and headache.

Prior to the introduction of the new codes, diagnoses of these common disorders were reported with ICD-9 codes that, in most cases, are not included in the ICD-9 category that specifies diagnoses of “Diseases of the Nervous System”. For example, prior to October 1, 2005, diagnoses of the various conditions that now fall under ICD-9 327 “organic sleep disorders”

**FIGURE 3.** Number of outpatient encounters and incident cases of pain-related diagnoses, by year, active component, U.S. Armed Forces, 1998-2010



were likely documented with ICD-9 codes that are classified under “Signs, Symptom, and Ill-Defined Conditions” (specifically, ICD-9 780.50-780.59) or “Mental Disorders” (specifically, ICD-9 307.41, 307.43, 307.45, and 306.8). Also, before 1 October 2006, diagnoses that are now classified under ICD-9 338 “pain, not elsewhere classified” were likely assigned diagnostic codes from several major categories, including “Mental Disorders” and disorders of the circulatory, digestive, and musculoskeletal systems. Similarly, diagnoses now classified under ICD-9 339 “other headache syndromes” (introduced on 1 October 2008) were likely documented with diagnostic codes from the major categories of “Signs, Symptoms and Ill-Defined Conditions” and “Mental Disorders”. (Of note, many encounters have been documented with diagnoses of “migraine” which have been and continue to be included in the major category of “Diseases of the Nervous System.”)

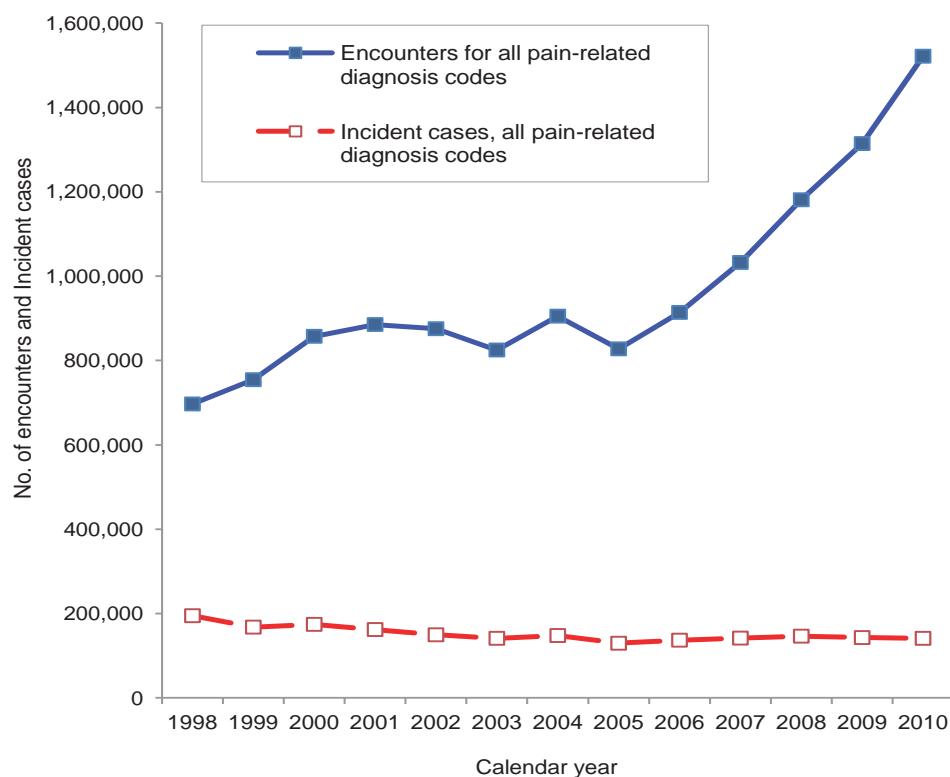
Individuals who are diagnosed with obstructive sleep apnea present a substantial burden to the health care system. For

example, service members with more than one encounter for this condition average 6.4 encounters; and approximately 14,000 affected service members have had 10 or more outpatient encounters in the course of their care. A previous study of obstructive sleep apnea among active duty service members documented a six-fold increase in incident diagnoses during the 10-year period 2000-2009.<sup>1</sup> Although the study confirmed that incidence rates increased with advancing age, consistent with the published literature, it was noteworthy that, within the oldest age group (40 years or more), the rates rose more than eight-fold during the 10-year surveillance period. Factors associated with these trends likely include increasing awareness of the importance of obstructive sleep apnea and its comorbidities and sequelae as well as increasing capabilities to screen for, detect, and diagnose this disorder. Against that backdrop, it is difficult to determine how much of the observed sharply increasing trend is attributable to an increase in the numbers and incidence rates of actual cases and how much is due to an enhancement of

the capability to detect cases.<sup>2-5</sup> Whatever factors underlie the surge in encounters and cases associated with obstructive sleep apnea, uses of diagnostic codes in the category of “Diseases of the Nervous System” has substantially increased the numbers and rates of neurological disorder-related diagnoses since 2005.

Numerous factors affect numbers of health care encounters for various diagnoses. For example, an increase in the actual incidence of a condition in a population of interest may be reflected as an increased frequency of health care utilization by those affected (if the condition is serious enough to prompt health care seeking behaviors). Epidemiologists and the public health community in general are most interested in discerning changes in incidence and prevalence in order to inform efforts at disease and injury prevention and control. In the case of the U.S. Armed Forces during an extended period of military conflict, military public health surveillance efforts seek to develop reasonably accurate estimates of the natures and magnitudes of the health impacts of military operations.

**FIGURE 4.** Outpatient encounters and incident cases, all pain-related diagnosis codes, by year, active component, U.S. Armed Forces, 1998-2010



Unfortunately, other factors may confound surveillance efforts to monitor incidence and prevalence. This report reveals that introductions of new ICD-9 codes into the broad category of neurological disorders likely altered coding practices by providers; incident diagnoses of neurological disorders in general sharply increased following introductions of the new codes. In the case of the new codes for “pain, not elsewhere classified”, for example, health care providers now have the opportunity to document the presence of pain symptoms that were not well described in the previously available codes for pain. The new codes available under ICD-9 338 provide for such entities as acute and chronic pain occurring after trauma and surgery and acute and chronic pain not otherwise characterized. Since the older codes tended to focus on pain localized to particular body locations, the newer codes permit the recording of pain symptoms that previously may have gone unrecorded in patients’ records.

Enhanced screening of a population for its members’ health status affords

the opportunity to increase the frequency of identification of cases of illnesses and injuries that might otherwise have gone unrecognized. Even if the true incidence or prevalence of a condition is stable in a population, closer scrutiny of its members will augment the counts of cases and affect the quantitative estimates of incidence and prevalence. Service members who have been engaged in combat operations in southwest Asia have been the subjects of more detailed medical screening in recent years as part of an effort to identify clinically subtle adverse health effects of their deployments. To the extent that such screening results in increased numbers of diagnosable conditions, interpretations of data summaries related to numbers and trends of diagnoses of various conditions must consider the effects of activities that increase the detection and reporting of cases.

A recent MSMR report considered the impact of screening on estimates of disease incidence and prevalence and also described a number of other factors that must be considered when interpreting

medical encounter data.<sup>6</sup> The report illustrated the potentially large effects of varying definitions, strategies, and data sources used in analytic methods on surveillance estimates of disease incidence. The case study utilized estimates of the incidence of traumatic brain injury, a disorder for which enhanced screening and new diagnostic and reporting guidelines have been implemented in the U.S. Armed Forces in the past few years.

In summary, there has been a dramatic increase in the numbers of service members’ health care encounters for Diseases of the Nervous System over the last 13 years and particularly after 2005. The vast majority of the increase in such encounters is attributable to the introduction of three new diagnostic codes that are classified in the ICD-9 as Diseases of the Nervous System. The clinical entities represented by the new codes for “organic sleep disorders”, “pain, not elsewhere classified”, and “other headache syndromes”, are all very common. The pre-existing codes which were, and can still be, used to document such entities are in most cases not classified under the ICD-9 category of Diseases of the Nervous System. To the extent that the new codes better represent clinical diagnoses and that health care providers have begun to use the new codes, the effect has been to boost the counts of neurological disorders overall and mask trends of the “true incidence” of such disorders over time. In addition, one of the new codes (ICD-9 327 “organic sleep disorders”) represents a diagnosis formerly classified under the category of Symptoms, Signs, and Ill-Defined Conditions; of note, this diagnosis has dramatically increased in reporting frequency during the surveillance period. This examination of trends in encounters and incident diagnoses of neurological disorders illuminates factors that should be considered when interpreting summaries of administrative data for use in estimating incidence, prevalence, and trends of diseases and injuries in general.

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# Alcohol-related Diagnoses, Active Component, U.S. Armed Forces, 2001-2010

Alcohol abuse and dependence in the U.S. military are well-described public health problems. From 2001-2010, numbers and rates of incident alcohol-related diagnoses and alcohol-related medical encounters have increased among active component members, with the sharpest increases since 2007. Numbers of hospital bed days for acute alcohol diagnoses increased more than three-fold. Incidence rates of acute and chronic alcohol-related diagnoses were highest in 21-24-year-old males in the Army, but among women rates were highest among those under 21. More than one-fifth (21%) of all acute alcohol-related encounters were recurrent diagnoses and the proportion of recurrences was higher among those in combat occupations (26%) and in the Air Force (35%). Recent increases in incident alcohol-related diagnoses may reflect increasing scrutiny of alcohol use among military members and a concomitant focus on referrals for evaluation of alcohol misuse.

**A**lcohol abuse and dependence in the U.S. military are well-described public health problems. Given the accessibility of alcohol and its common use in military culture, service members may use alcohol consumption as a recreational activity or to help cope with stressful or traumatic events associated with military duties or combat.<sup>1,2</sup> Among respondents to a 2008 survey of health-related behavior, 47 percent of service members self-reported as “binge drinkers”; military personnel showed significantly higher rates of “heavy drinking” than civilians across all age groups; and 5 percent reported possible “dependence”.<sup>3</sup>

Alcohol abuse and dependence can result in serious consequences that impede the operational effectiveness of the force and may negatively impact family life and career advancement. Abuse and dependence are associated with poor health outcomes (e.g., poisonings, long-term sequelae of chronic abuse), social disruption (e.g., domestic strife), career stunting (e.g., low performance ratings, loss of promotion, attrition from service), misconduct (e.g., fighting, drunk driving), and accidental and intentional injuries.<sup>2,3</sup>

This report describes the ten-year trends and demographic characteristics of acute, chronic, and “recurrent”

alcohol-related diagnoses among active component members of the U.S. Armed Forces.

## METHODS

The surveillance period was 1 January 2001 to 31 December 2010. The surveillance population included all individuals who served in the active component of any branch of the U.S. military at any time during the surveillance period. Records of health care encounters (hospitalizations and outpatient clinic visits) in the Defense Medical Surveillance System were searched to identify encounters associated with alcohol abuse-related ICD-9 diagnostic codes. Medical encounters that included alcohol abuse-related ICD-9-CM codes (in any diagnostic position) were used to define “acute” or “chronic” cases (**Table 1**). An individual’s first encounter of acute and/or chronic abuse was recorded as the incident date; each service member could be counted as an acute case and/or a chronic case only once each during the surveillance period.

A “recurrent acute” case was defined as an individual with three or more acute encounters each separated by at least 30 days but occurring within 1 year of the first

**TABLE 1.** ICD-9-CM diagnostic codes for alcohol-related diagnoses

### Acute case

305.0x	Alcohol abuse/drunk NOS
980.x	Toxic effect of alcohol
790.3	Excessive BAC
E860.x	Alcohol poisoning

### Chronic case

303.0x	Acute intoxication in presence of alcohol dependence
291.x	Alcohol-induced mental disorders
303.9x	Other and unspecified alcohol dependence (chronic alcoholism)
571.0-571.3	Alcoholic liver disease
425.5	Alcoholic cardiomyopathy
535.3x	Alcoholic gastritis
357.5	Alcoholic polyneuropathy
V11.3	Personal history of alcoholism

of the three diagnoses. An individual could be a “recurrent acute” case only once during the surveillance period.

Counts of medical evacuations (MEDEVACs) for alcohol-related conditions were derived from records of service members who were medically evacuated during the surveillance period from the U.S. Central Command (CENTCOM) area of responsibility (AOR) to a medical treatment facility outside of CENTCOM AOR. Evacuations were included in analyses if the affected service member had at least one inpatient or outpatient alcohol-related medical encounter in a fixed U.S. military medical facility within 10 days after the evacuation date.

To estimate the health care burden associated with alcohol abuse, all inpatient and outpatient medical encounters with alcohol abuse-related ICD-9-CM codes (per **Table 1**) reported as primary (first-listed) diagnoses were identified. Health care burdens were quantified by the total number of medical encounters attributable to an acute or chronic alcohol diagnosis; the

total number of unique individuals affected by an acute or chronic diagnosis; and the total number of bed-days during hospitalizations for acute or chronic diagnoses.

## RESULTS

### Acute cases

During the 10-year surveillance period, 190,302 active component members had at least one medical encounter in which they received an acute alcohol diagnosis (crude incidence rate: 13.72 per 1,000 person-years [p-yrs]). Of these incident diagnoses, 21% ( $n=39,819$ ) were considered recurrent acute cases.

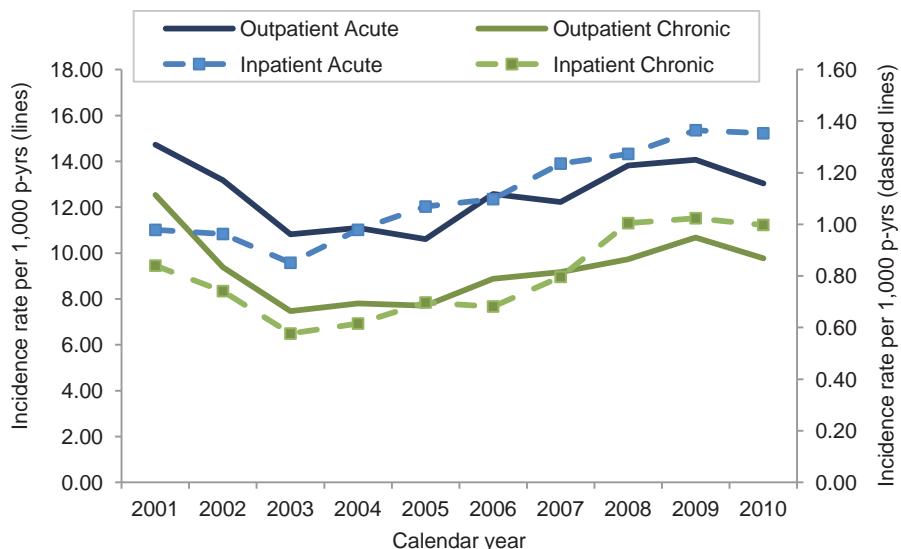
Among active component members, annual numbers and rates of both inpatient and outpatient incident acute alcohol diagnoses decreased slightly from 2001 to 2003, remained relatively stable until 2005 and then increased slightly until 2009 (Figure 1). The rates of inpatient incident acute diagnoses were marginally higher at the end compared to the beginning of the surveillance period (crude incidence rate 1.35 per 1,000 p-yrs in 2010 vs. 0.98 per 1,000 p-yrs in 2001); incident outpatient diagnoses were slightly lower in 2010 than in 2001 (crude incidence rate 13.04 per 1,000 p-yrs vs. 14.72 per 1,000 p-yrs).

The crude overall incidence rate of acute alcohol diagnoses among males (14.52 per 1,000 p-yrs) was 1.6 times the rate among females (9.13 per 1,000 p-yrs). In females, the crude incidence rates decreased monotonically with age, while for males, incidence rates were highest in the 21-24 year old category (7.4 per 1,000 p-yrs) and then decreased with increasing age (Table 2).

Overall, and among both males and females, crude incidence rates of acute alcohol diagnoses were higher in the Army than the other services. In each of the Services, rates were highest among males younger than 25 years old and then sharply declined with increasing age; among females, rates were highest among those younger than 21 years old and then declined with increasing age (Figures 2a,b).

Although numbers of total alcohol related medical encounters did not

**FIGURE 1.** Incidence rates of acute and chronic alcohol-related inpatient and outpatient cases, active component, U.S. Armed Forces, 2001-2010



increase in a linear fashion during the surveillance period, the number of medical encounters in 2010 ( $n=109,780$ ) was approximately 50% higher than in 2001 ( $n=72,931$ ). Active component members with incident acute alcohol diagnoses accounted for a more than three-fold increase in numbers of hospital bed days during the period (Figure 3a).

### Chronic cases

During the 10-year surveillance period, 141,341 active component members had at least one medical encounter in which they received a chronic alcohol diagnosis (crude incidence rate: 10.10 per 1,000 p-yrs).

Patterns that were evident in relation to incident acute diagnoses were similar to those in relation to incident chronic diagnoses. For example, among active component members, annual numbers and rates of both inpatient and outpatient incident chronic alcohol diagnoses slightly decreased in the beginning of the surveillance period and then slightly increased. Also, crude incidence rates were lower for outpatient chronic incident diagnoses in 2010 than in 2001 (crude incidence rate: 9.77 vs. 12.53 per 1,000 p-yrs) while inpatient chronic incident diagnoses were marginally higher at the end than the beginning

of the surveillance period (crude incidence rate: 1.00 vs. 0.80 per 1,000 p-yrs (Figure 1)).

As with acute diagnoses, the crude overall incidence rate of chronic alcohol diagnoses was higher among males than females (10.72 vs. 6.51 per 1,000 p-yrs). Also, among females, crude incidence rates were highest among the youngest aged and then decreased monotonically with age, while among males, incidence rates were highest among 21-24 year olds and then decreased sharply with age (Figures 2c,d).

Among active component members with incident chronic alcohol-related diagnoses, both total alcohol-related medical encounters and hospital bed days markedly increased during 2007-2010 (Figure 3b).

### Recurrent cases

Approximately 21% of total incident acute alcohol diagnoses were considered recurrent cases (i.e., affected members had had at least three medical encounters with acute alcohol diagnoses). While more males than females had recurrent acute alcohol encounters, the proportions of all incident acute encounters that were recurrent did not substantially differ between the genders. Senior enlisted members (grades E5-E9) had a marginally higher proportion (22%) of recurrent alcohol diagnoses than those in other military grades. Across

**TABLE 2.** Number and incidence rates of acute and chronic cases and number and percentage of “recurrent acute” cases, active component, U.S. Armed Forces, 2001-2010

	Acute Cases			Chronic Cases			Recurrent Cases	
	No	Rate	IRR <sup>a</sup>	No	Rate	IRR <sup>a</sup>	No.	% of all incident acute cases
Total	190,302	13.72	.	141,341	10.10	.	39,819	21
Inpatient	15,462	1.12	.	11,151	0.80	.	.	.
Outpatient	174,840	12.61	.	130,190	9.31	.	.	.
Sex								
Female	18,576	9.13	Ref	13,324	6.51	Ref	3,942	21
Male	171,726	14.52	1.6	128,017	10.72	1.6	35,877	21
Age group								
<21	42,194	21.53	6.5	27,849	14.13	4.2	7,936	19
21-24	86,932	23.57	7.1	63,061	16.86	5.0	18,008	21
25-29	35,728	12.05	3.6	27,475	9.14	2.7	8,279	23
30-34	12,844	6.41	1.9	10,770	5.33	1.6	2,946	23
35-39	7,667	4.35	1.3	7,172	4.05	1.2	1,719	22
40+	4,937	3.33	Ref	5,014	3.38	Ref	931	19
Age group (males)								
<21	36,825	22.47	6.5	24,166	14.66	4.2	6,864	19
21-24	79,042	25.46	7.4	57,598	18.28	5.2	16,306	21
25-29	32,598	13.05	3.8	25,147	9.92	2.8	7,580	23
30-34	11,767	6.79	2.0	9,903	5.67	1.6	2,696	23
35-39	7,017	4.51	1.3	6,618	4.24	1.2	1,584	23
40+	4,477	3.44	Ref	4,585	3.52	Ref	847	19
Age group (females)								
<21	5,369	16.72	6.6	3,683	11.43	4.9	1,072	20
21-24	7,890	13.52	5.3	5,463	9.28	3.9	1,702	22
25-29	3,130	6.72	2.7	2,328	4.96	2.1	669	22
30-34	1,077	3.95	1.6	867	3.16	1.3	250	23
35-39	650	3.10	1.2	554	2.64	1.1	135	21
40+	460	2.53	Ref	429	2.35	Ref	84	18
Race/ethnicity								
White, non-Hispanic	127,204	14.52	1.8	95,995	10.86	1.9	26,922	21
Black, non-Hispanic	27,348	11.26	1.4	19,402	7.93	1.4	5,653	21
Hispanic	20,953	15.05	1.8	14,865	10.55	1.9	4,285	20
Asian/Pacific Islander	5,240	8.19	Ref	3,612	5.61	Ref	1,077	21
American Indian/Alaskan Native	5,321	23.41	2.9	4,415	19.20	3.4	1,033	19
Other	4,236	10.18	1.2	3,052	7.28	1.3	849	20
Service								
Army	92,330	18.92	2.6	63,690	12.88	2.6	21,977	24
Navy	42,319	12.41	1.7	35,523	10.34	2.1	5,923	14
Air Force	24,414	7.17	Ref	16,808	4.91	Ref	8,455	35
Marine Corps	26,131	14.61	2.0	21,989	12.22	2.5	2,673	10
Coast Guard	5,108	13.38	1.9	3,331	8.62	1.8	791	15
Military status (grade)								
Junior enlisted (E1-E4)	148,101	24.61	19.0	107,615	17.68	12.9	30,806	21
Senior enlisted (E5-E9)	37,323	6.74	5.2	29,957	5.36	3.9	8,104	22
Junior officers (O1-O3 [W1-W3])	3,707	2.64	2.0	2,535	1.80	1.3	670	18
Senior officers (O4-O10 [W4-W5])	1,168	1.29	Ref	1,234	1.37	Ref	239	20
Occupation								
Combat-specific	12,001	10.52	Ref	8,954	7.79	Ref	3,139	26
Healthcare	46,274	16.43	1.6	33,891	11.91	1.5	8,932	19
Other	132,027	13.32	1.3	98,496	9.85	1.3	27,748	21

<sup>a</sup>Incidence Rate Ratio (IRR)

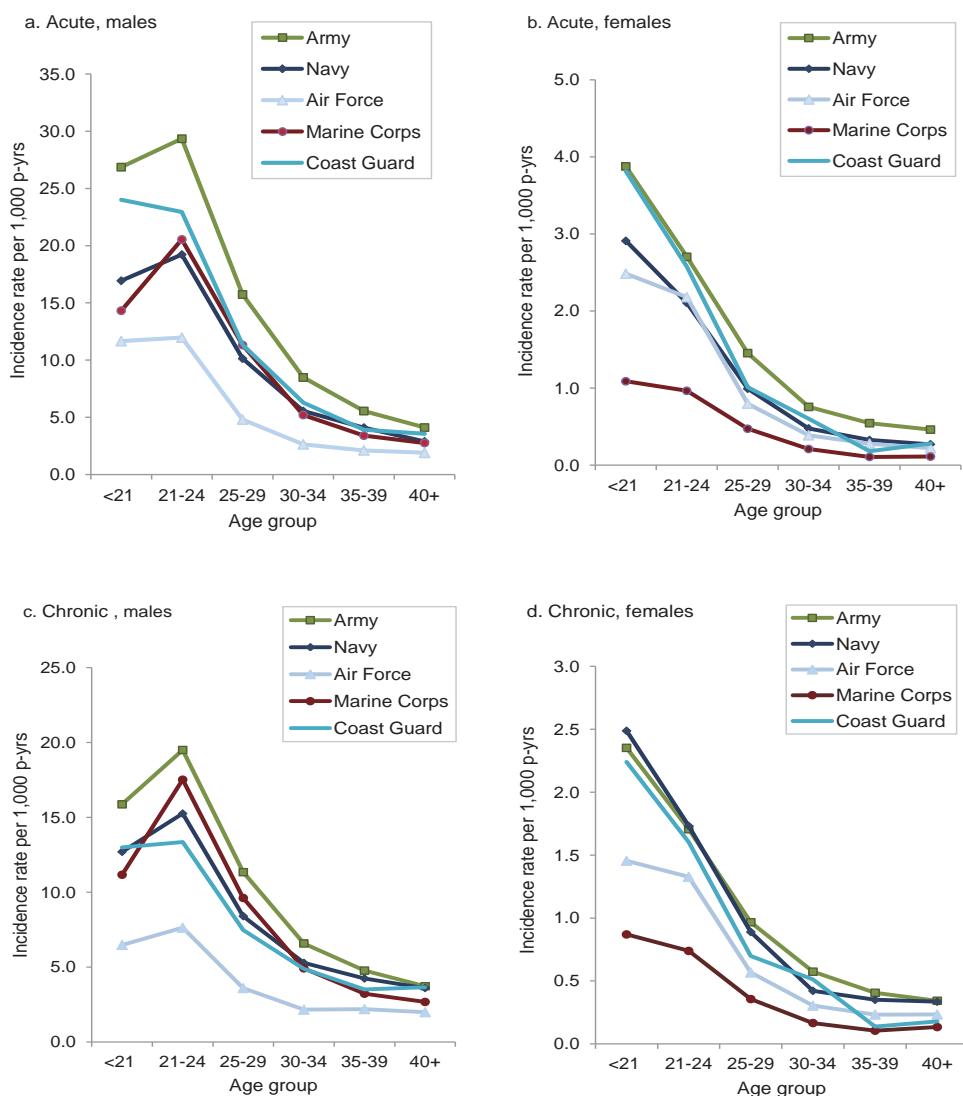
all demographic and military subgroups, the highest proportions of recurrent acute encounters affected service members in combat-specific occupations (26%) and in the Air Force (35%) (**Table 2**).

### MEDEVACs

During the approximately nine-year portion of the surveillance period for which medical evacuation data were

available (October 2001–December 2010), records of 75 medical evacuations included acute or chronic alcohol diagnoses in at least one diagnostic position. Of these, more than 50% (n=41) documented acute

**FIGURES 2A-D.** Incidence rates of acute and chronic alcohol-related cases by age group and service and by gender, active component, U.S. Armed Forces, 2001-2010



alcohol diagnoses (e.g., ICD-9-CM 305.00 “alcohol abuse, unspecified”; ICD-9-CM 303.00 “acute alcohol intoxication, unspecified”), and eight evacuations were related to alcohol withdrawal (e.g., ICD-9-CM 291.81 “alcohol withdrawal”). “Other alcoholic psychoses” (ICD-9-CM 291.89) was the sole diagnostic code on records of two medical evacuations (**data not shown**).

#### EDITORIAL COMMENT

This report provides an overview of incident alcohol-related diagnoses during the past ten years. It documents a gradual increase in counts and rates of both acute and chronic incident alcohol

diagnoses over the past several years, as well as sharp increases in alcohol-related medical encounters. More than one-fifth of incident acute alcohol-related encounters were recurrences; recurrent encounters affected military members who had received medical care multiple times for acute alcohol-related diagnoses. The proportions of acute incident alcohol diagnoses that were recurrent were relatively higher among Air Force members, senior-enlisted personnel, and those serving in combat occupations.

Throughout history, alcohol misuse and abuse have been problematic for military forces. In the past few years, the issue has received increasing attention from senior military leaders; it has continued to be an area of concern due to the harmful

effects of excessive drinking on the health and safety of service members and others and the detrimental impacts excessive or irresponsible drinking can have on work performance and operational effectiveness.

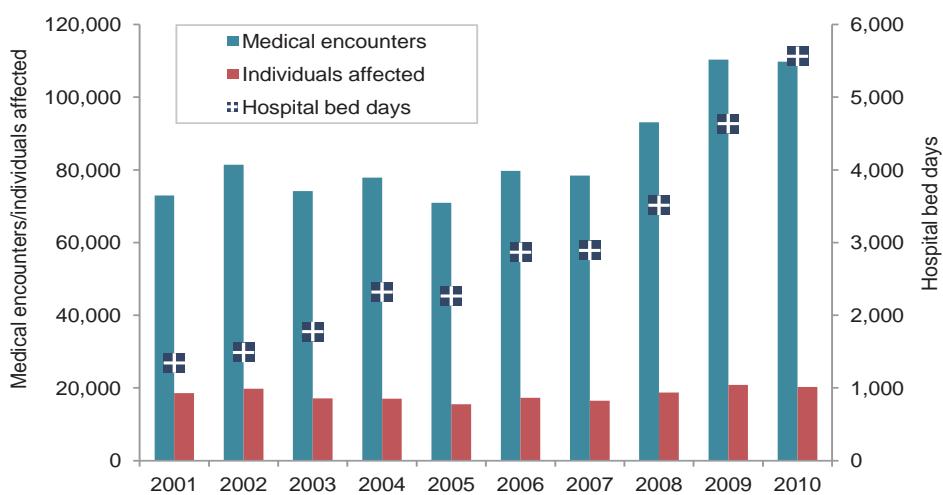
In 2006, an Air Force report stated that irresponsible drinking was a factor in 33% of suicides, 57% of sexual assaults, 29% of domestic violence incidents and 44% of fatal motor vehicle accidents.<sup>4</sup> In June of 2010, Admiral J.C. Harvey Jr., U.S. Fleet Forces Commander stated that “...the single biggest issue we face with respect to the degradation of readiness due to misconduct is the irresponsible use of alcohol. The large majority of the sitreps/opreps I receive reporting incidents of domestic violence, sexual assault, vehicle/motorcycle mishaps etc. have alcohol abuse as a key contributing factor.”<sup>5</sup> In the same year, General Peter Chiarelli, Vice Chief of Staff of the U.S. Army, suggested that the Army should double the number of substance abuse counselors to accommodate increasing numbers of soldiers seeking treatment for alcohol-related conditions.<sup>6</sup>

The results of the 2008 DoD Survey of Health Behaviors indicate that “...1 in 5 active duty personnel meet criteria for heavy alcohol use -- the consumption level most likely to result in alcohol-related problems...” This survey also documented that rates of heavy drinking have remained stable since 1980 despite significant efforts by the DoD to reduce rates of excessive alcohol consumption.<sup>3</sup> The results of this analysis demonstrate the increasing medical burden that excessive alcohol use is placing on the military health system; this is especially noteworthy for service members with chronic alcohol diagnoses. The number of bed days attributable to chronic alcohol abuse diagnoses has almost quadrupled over the surveillance period. This highlights the need for continued emphasis on the prevention, early identification and treatment of alcohol related disorders.

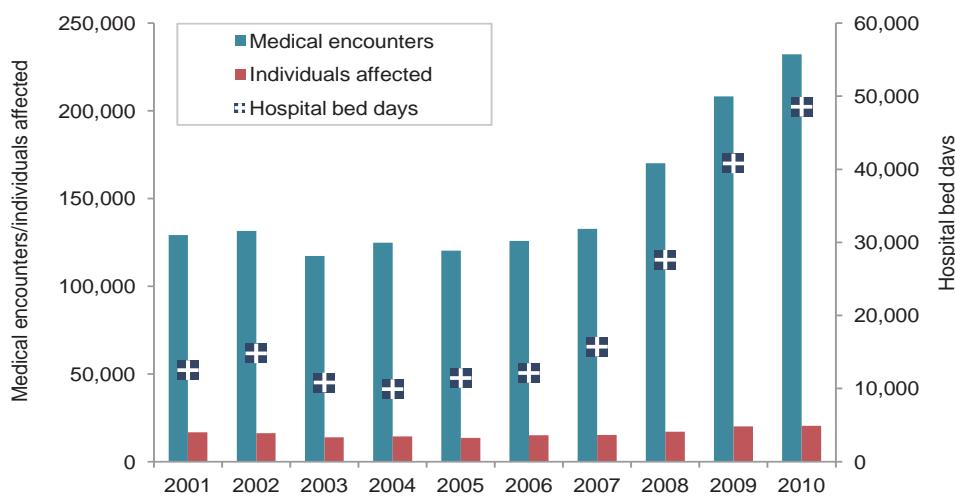
The finding that incidence rates of acute alcohol-related diagnoses in women were highest among those under 21 is striking and troubling. Previous MSMR analyses have documented significant numbers of teenaged service members who have received diagnoses of alcohol abuse.<sup>7</sup> Continued and sustained focus on reducing

**FIGURES 3A - B.** Medical encounters, individuals affected, and hospital bed days for acute and chronic alcohol-related diagnoses, by calendar year, active component, U.S. Armed Forces, 2001-2010

a. Acute



b. Chronic



excessive drinking in this group is especially warranted.

Several factors should be considered when interpreting the findings of this report. For example, for these analyses, diagnoses of acute and chronic alcohol diagnoses were ascertained from diagnoses reported on standardized administrative records of ambulatory medical encounters and hospitalizations in fixed military and civilian (if reimbursed through the Military Health System) treatment facilities. However, counts and rates reported here do not include medical care that may have been provided in settings not captured in

the administrative data used in this report (e.g., ship board, private sources of care not reimbursed by TRICARE).

Increases in incident alcohol-related diagnoses may indicate that increasing proportions of affected service members are presenting for care voluntarily. The DoD has made significant efforts to reduce stigma associated with seeking care for alcohol related issues; for example, three Army installations are piloting a program that enables service members to receive alcohol-related counseling without it being reported to their commanders.<sup>6</sup>

Recent increases in incident alcohol-related diagnoses documented here may reflect increasing scrutiny of alcohol use among military members and a concomitant focus on referrals of service members for evaluation of alcohol misuse. Each of the services requires mandatory referral for substance abuse evaluation in the event a military member has a positive result from a breath/blood alcohol test or is identified by military or civilian law enforcement officials as having been involved in an alcohol-related incident. In addition, service members returning from deployment are screened via questionnaire for potential alcohol use problems.

In summary, alcohol misuse and abuse continue to threaten the health, safety, and military operational effectiveness of service members and their units. In addition, alcohol-related medical encounters and associated illnesses and injuries have relatively large impacts on the resources (e.g., evaluation, counseling, treatment, disability compensation) of the Military Health System. Commanders, supervisors, and health care workers at all levels should continue to focus on the prevention and early treatment of alcohol misuse and abuse among military members.

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# Update: Cold Weather Injuries, U.S. Armed Forces, July 2006-June 2011

From July 2010 through June 2011, the number of U.S. service members treated for cold injuries ( $n=557$ ) was similar to recent prior years. The most frequently reported cold injury was hypothermia in the Marine Corps and frostbite in the other service branches. Cold injury rates were generally highest among service members who were less than 20 years old and of black, non-Hispanic race/ethnicity. Service members who train in wet and freezing conditions - and their supervisors at all levels - should know the signs of cold injury, ensure adequate hydration, and avoid tobacco, caffeine, and vasoconstrictive medications.

Prolonged and/or intense exposures to cold can significantly impact the health, well-being and operational effectiveness of service members and their units.<sup>1-5</sup> Because U.S. military operations are conducted in diverse geographic and weather conditions, the U.S. military has developed extensive countermeasures against threats associated with training and operating in cold environments.<sup>1-6</sup>

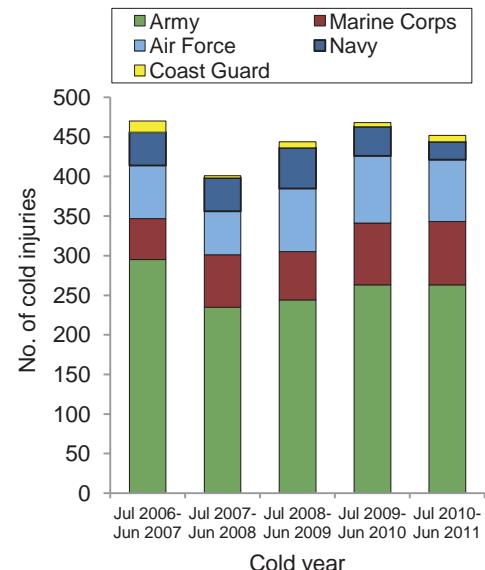
In recent years, rates of hospitalization for cold weather injuries of U.S. military members have generally declined, at least in part, because of improvements in clothing, equipment, policies, and practices.<sup>2</sup>

Still, cold injuries (many of them preventable) affect hundreds of service members each year. This report summarizes frequencies, rates, and correlates of risk of cold injuries among members of active and reserve components of the U.S. Armed Forces during the past five years.

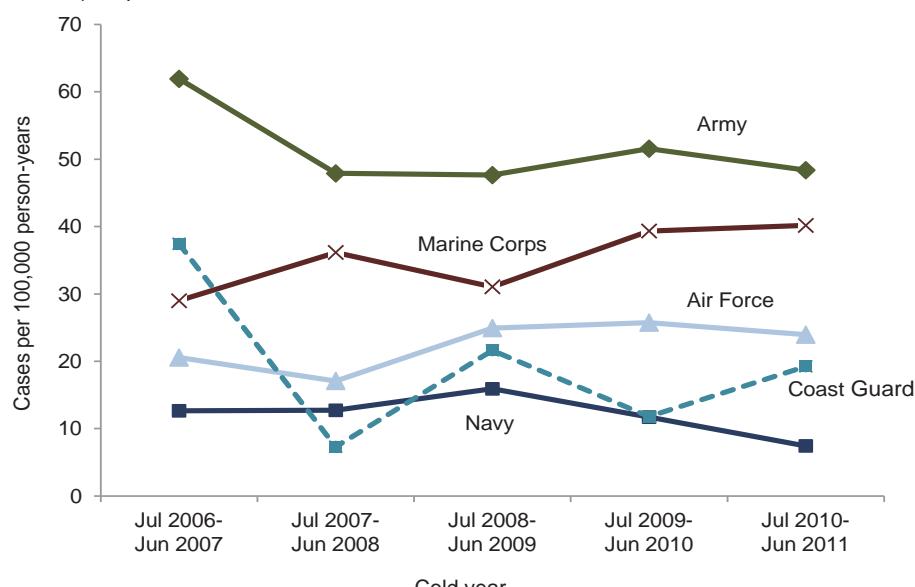
## METHODS

The surveillance period was 1 July 2006 to 30 June 2011. The surveillance population included all individuals who served

**FIGURE 2.** Cold injuries<sup>a</sup> among members of active and reserve components, U.S. Armed Forces, by service and year, July 2006-June 2011



**FIGURE 1.** Rates of cold injury<sup>a</sup> by service and year, active component, U.S. Armed Forces, July 2006-June 2011



<sup>a</sup>One cold injury per individual per year

in an active and/or reserve component of the U.S. Armed Forces any time during the surveillance period. For analysis purposes, years were divided into 1 July through 30 June intervals so that complete "cold weather seasons" could be represented in year-to-year summaries.

Inpatient, outpatient, and reportable medical event records in the Defense Medical Surveillance System (DMSS) were searched to identify all primary (first-listed) diagnoses of "frostbite" (ICD-9-CM codes: 991.0-991.3), "immersion foot" (ICD-9-CM: 991.4), "hypothermia" (ICD-9-CM: 991.6), and "other specified/unspecified effects of reduced temperature" (ICD-9-CM: 991.8-991.9). To exclude follow-up encounters for single cold injury episodes, only one cold injury per individual per year was included. In summaries by type of cold injury, one of each type of cold injury per individual per year was included. If multiple medical encounters for cold injuries occurred on the same day, only one was used for analysis (hospitalizations were prioritized over ambulatory visits).

Annual rates of cold injuries (per 100,000 person-years of service) were

**TABLE 1A.** Cold injuries, active component, U.S. Army, July 2006-June 2011

	Frostbite		Immersion foot		Hypothermia		Unspecified		All cold injuries <sup>b</sup>	
	No.	Rate <sup>a</sup>	No.	Rate <sup>a</sup>	No.	Rate <sup>a</sup>	No.	Rate <sup>a</sup>	No.	Rate <sup>a</sup>
Total	688	25.7	150	5.6	148	5.5	390	14.5	1,376	51.3
Sex										
Male	517	22.3	133	5.7	128	5.5	243	10.5	1,021	44.1
Female	171	46.9	17	4.7	20	5.5	147	40.3	355	97.4
Race/ethnicity										
White, non-Hisp	297	17.8	97	5.8	93	5.6	154	9.3	641	38.5
Black, non-Hisp	293	54.8	37	6.9	34	6.4	179	33.5	543	101.5
Other	98	20.3	16	3.3	21	4.3	57	11.8	192	39.8
Age group										
<20	69	42.0	19	11.6	26	15.8	58	35.3	172	104.6
20-24	269	31.8	62	7.3	76	9.0	144	17.0	551	65.2
25-29	159	24.5	34	5.2	23	3.5	80	12.3	296	45.6
30-34	78	19.4	17	4.2	11	2.7	49	12.2	155	38.6
35-39	57	17.1	14	4.2	5	1.5	33	9.9	109	32.7
40-44	34	17.8	3	1.6	5	2.6	16	8.4	58	30.4
45+	22	22.7	1	1.0	2	2.1	10	10.3	35	36.0
Military status										
Enlisted	629	28.1	135	6.0	139	6.2	353	15.8	1,256	56.1
Officer	59	13.3	15	3.4	9	2.0	37	8.3	120	27.0
Cold year (Jul-Jun)										
2006-2007	154	30.7	37	7.4	28	5.6	92	18.3	311	61.9
2007-2008	124	23.8	27	5.2	26	5.0	72	13.8	249	47.9
2008-2009	131	24.2	27	5.0	26	4.8	74	13.7	258	47.6
2009-2010	131	23.7	38	6.9	31	5.6	85	15.4	285	51.5
2010-2011	148	26.2	21	3.7	37	6.6	67	11.9	273	48.4

<sup>a</sup>Rate per 100,000 person-years<sup>b</sup>One of each type of cold injury per individual per year**TABLE 1B.** Cold injuries, active component, U.S. Navy, July 2006-June 2011

	Frostbite		Immersion foot		Hypothermia		Unspecified		All cold injuries <sup>b</sup>	
	No.	Rate <sup>a</sup>	No.	Rate <sup>a</sup>	No.	Rate <sup>a</sup>	No.	Rate <sup>a</sup>	No.	Rate <sup>a</sup>
Total	84	5.1	44	2.7	44	2.7	27	1.6	199	12.1
Sex										
Male	71	5.1	40	2.9	40	2.9	24	1.7	175	12.5
Female	13	5.2	4	1.6	4	1.6	3	1.2	24	9.7
Race/ethnicity										
White, non-Hisp	45	5.0	27	3.0	23	2.6	14	1.6	109	12.2
Black, non-Hisp	16	5.7	3	1.1	9	3.2	7	2.5	35	12.5
Other	23	4.9	14	3.0	12	2.5	6	1.3	55	11.7
Age group										
<20	15	15.9	15	15.9	5	5.3	3	3.2	38	40.2
20-24	33	6.2	16	3.0	24	4.5	11	2.1	84	15.8
25-29	17	4.4	6	1.6	8	2.1	6	1.6	37	9.6
30-34	5	2.0	4	1.6	5	2.0	3	1.2	17	6.9
35-39	5	2.4	2	1.0	1	0.5	1	0.5	9	4.3
40-44	5	4.5	1	0.9	0	0.0	2	1.8	8	7.1
45+	4	6.2	0	0.0	1	1.6	1	1.6	6	9.4
Military status										
Enlisted	71	5.1	40	2.9	42	3.0	22	1.6	175	12.6
Officer	13	5.0	4	1.5	2	0.8	5	1.9	24	9.2
Cold year (Jul-Jun)										
2006-2007	15	4.4	7	2.1	17	5.0	4	1.2	43	12.6
2007-2008	21	6.4	9	2.7	3	0.9	9	2.7	42	12.7
2008-2009	25	7.6	14	4.3	8	2.4	5	1.5	52	15.9
2009-2010	11	3.4	12	3.7	9	2.8	6	1.8	38	11.7
2010-2011	12	3.7	2	0.6	7	2.2	3	0.9	24	7.4

<sup>a</sup>Rate per 100,000 person-years<sup>b</sup>One of each type of cold injury per individual per year

estimated only for the active component because the start and end dates of all active duty service periods of reserve component members were not available.

## RESULTS

From July 2010 through June 2011, 557 members of the U.S. Armed Forces had at least one medical encounter with a primary diagnosis of cold injury. During the past year, nearly one-fifth (n=105) of those affected by cold injury were members of the reserve component. The numbers of reserve component members affected by cold injuries in 2010-11 was similar to recent prior years (**data not shown**).

During the year, 452 members of the active component were affected by cold injuries; in general, the cold injury rates among active component members (32 per 100,000 person years [p-yrs]) have been remarkably stable over the past four years (**data not shown**).

During the 2010-11 cold season, in the active components of the Services, the rate of any cold injury in the Army (46.6 per 100,000 p-yrs) was approximately 17 percent higher than in the Marine Corps (39.7 per 100,000 p-yrs), 142 percent higher than in the Coast Guard (19.2 per 100,000 p-yrs), 95% higher than in the Air Force (23.6 per 100,000 p-yrs), and approximately five and a half times higher than in the Navy (7.1 per 100,000 p-yrs) (**Figure 1**). In the past year, soldiers accounted for more than one-half (58%) of all active component members affected by cold injuries (**Figure 2**).

During the past cold season, the most frequently reported cold injuries among the Services were hypothermia in the Marine Corps and frostbite in the Army, Navy, Air Force and Coast Guard (**Table 1a-e**). In the Army, the rate of cold injuries (any cause) in 2010-11 was similar to that of the previous 3 years; there were increases in the numbers of frostbite and hypothermia cases and declines in immersion foot and unspecified cold injuries (**Table 1a**). In the Air Force, the rate of cold injuries (any cause) in 2010-11 was similar to those of the previous four years (**Table 1c**). In the

**TABLE 1C.** Cold injuries, active component, U.S. Air Force, July 2006-June 2011

	Frostbite		Immersion foot		Hypothermia		Unspecified		All cold injuries <sup>b</sup>	
	No.	Rate <sup>a</sup>	No.	Rate <sup>a</sup>	No.	Rate <sup>a</sup>	No.	Rate <sup>a</sup>	No.	Rate <sup>a</sup>
Total	203	12.3	48	2.9	49	3.0	71	4.3	371	22.4
Sex										
Male	169	12.7	41	3.1	42	3.2	47	3.5	299	22.5
Female	34	10.6	7	2.2	7	2.2	24	7.5	72	22.4
Race/ethnicity										
White, non-Hisp	128	10.9	38	3.2	31	2.6	41	3.5	238	20.3
Black, non-Hisp	44	18.5	8	3.4	12	5.1	23	9.7	87	36.7
Other	31	12.6	2	0.8	6	2.4	7	2.9	46	18.8
Age group										
<20	26	33.9	7	9.1	3	3.9	12	15.7	48	62.6
20-24	90	19.0	24	5.1	22	4.6	30	6.3	166	35.0
25-29	38	9.4	6	1.5	11	2.7	12	3.0	67	16.6
30-34	22	8.4	5	1.9	2	0.8	8	3.0	37	14.1
35-39	14	6.3	3	1.3	6	2.7	3	1.3	26	11.7
40-44	8	5.5	2	1.4	1	0.7	4	2.7	15	10.2
45+	5	7.6	1	1.5	4	6.1	2	3.0	12	18.3
Military status										
Enlisted	171	12.9	46	3.5	44	3.3	64	4.8	325	24.6
Officer	32	9.7	2	0.6	5	1.5	7	2.1	46	13.9
Cold year (Jul-Jun)										
2006-2007	43	12.6	7	2.1	10	2.9	10	2.9	70	20.6
2007-2008	34	10.4	6	1.8	6	1.8	10	3.1	56	17.1
2008-2009	33	10.2	17	5.2	12	3.7	19	5.8	81	24.9
2009-2010	47	14.2	5	1.5	11	3.3	22	6.7	85	25.7
2010-2011	46	13.9	13	3.9	10	3.0	10	3.0	79	23.9

<sup>a</sup>Rate per 100,000 person-years<sup>b</sup>One of each type of cold injury per individual per year**TABLE 1D.** Cold injuries, active component, U.S. Marine Corps, July 2006-June 2011

	Frostbite		Immersion foot		Hypothermia		Unspecified		All cold injuries <sup>b</sup>	
	No.	Rate <sup>a</sup>	No.	Rate <sup>a</sup>	No.	Rate <sup>a</sup>	No.	Rate <sup>a</sup>	No.	Rate <sup>a</sup>
Total	112	11.5	90	9.3	105	10.8	36	3.7	343	35.3
Sex										
Male	99	10.9	89	9.8	98	10.8	33	3.6	319	35.0
Female	13	21.0	1	1.6	7	11.3	3	4.9	24	38.8
Race/ethnicity										
White, non-Hisp	63	9.5	66	9.9	63	9.5	22	3.3	214	32.2
Black, non-Hisp	32	32.7	9	9.2	20	20.4	6	6.1	67	68.4
Other	17	8.1	15	7.1	22	10.5	8	3.8	62	29.5
Age group										
<20	28	22.4	38	30.4	37	29.6	9	7.2	112	89.5
20-24	47	10.1	45	9.6	54	11.6	19	4.1	165	35.3
25-29	19	10.3	5	2.7	9	4.9	6	3.2	39	21.1
30-34	14	15.5	2	2.2	4	4.4	2	2.2	22	24.4
35-39	3	4.7	0	0.0	0	0.0	0	0.0	3	4.7
40-44	0	0.0	0	0.0	1	3.5	0	0.0	1	3.5
45+	1	8.1	0	0.0	0	0.0	0	0.0	1	8.1
Military status										
Enlisted	83	9.5	86	9.9	99	11.4	28	3.2	296	34.0
Officer	29	28.4	4	3.9	6	5.9	8	7.8	47	46.0
Cold year (Jul-Jun)										
2006-2007	26	14.5	16	8.9	5	2.8	5	2.8	52	29.0
2007-2008	17	9.0	20	10.6	21	11.2	10	5.3	68	36.2
2008-2009	17	8.5	18	9.0	20	10.0	7	3.5	62	31.1
2009-2010	28	13.8	12	5.9	33	16.2	7	3.4	80	39.3
2010-2011	24	11.9	24	11.9	26	12.9	7	3.5	81	40.2

<sup>a</sup>Rate per 100,000 person-years<sup>b</sup>One of each type of cold injury per individual per year

Marine Corps, the rate of cold injuries in 2010-11 was slightly higher than in the previous four years: the increase overall was attributable to an increase in immersion foot cases (**Table 1d**). In the Navy, the rate of cold injuries in 2010-11 was lower than in the previous four years; the relatively low rate overall reflected a sharp decrease in immersion foot cases (**Table 1b**). In the Coast Guard in 2010-11, there were eight cold injury cases of which four were frostbite (**Table 1e**).

During the past five years, in the Army, Marine Corps and Coast Guard, rates of frostbite and “unspecified” cold injuries — and cold injuries overall — were sharply higher among females than males (**Tables 1a,d,e**). In the Air Force and Navy, there were no clear relationships between gender and cold injury risk (**Tables 1b-c**).

In the Army, Air Force, and Marine Corps, rates of frostbite, in particular, and cold injuries overall were sharply higher among black non-Hispanic than other racial-ethnic group members. In the Navy and Coast Guard, there were no clear relationships between race-ethnicity and cold injury risk (**Tables 1a-e**).

In general, rates of cold injuries were higher among the youngest aged (<20 years old) and enlisted members relative to their respective counterparts. However, in the Air Force, rates of hypothermia were higher among 20-24-year-olds than those younger or older; and in the Marine Corps, rates of frostbite were three times higher among officers than enlisted members (**Tables 1a-e**). During the five-year surveillance period, there were 2,235 active component service members affected by cold injury. Of these, 73 (3.3%) were recruits/basic trainees. Marine Corps recruits accounted for relatively more of the total cold injuries of their service (9.8% of all cold injuries during the period) than did recruits of the other services (Army, 2.5%; Navy, 1.5%; Air Force, 1.4%) (**data not shown**). Also during the period, 56 (2.5%) of the 2,235 service members affected with cold injuries were hospitalized. Most (82%) of the hospitalized cases affected Army (n=34) or Marine Corps (n=12) members (**data not shown**).

During the five-year surveillance period, 30 or more cold injuries were diagnosed at

**TABLE 1E.** Cold injuries, active component, U.S. Coast Guard, July 2006-June 2011

	Frostbite		Immersion foot		Hypothermia		Unspecified		All cold injuries <sup>b</sup>	
	No.	Rate <sup>a</sup>	No.	Rate <sup>a</sup>	No.	Rate <sup>a</sup>	No.	Rate <sup>a</sup>	No.	Rate <sup>a</sup>
Total	15	7.3	4	1.9	15	7.3	6	2.9	40	19.4
Sex										
Male	11	6.1	4	2.2	14	7.8	5	2.8	34	18.8
Female	4	15.3	0	0.0	1	3.8	1	3.8	6	23.0
Race/ethnicity										
White, non-Hisp	10	6.8	3	2.0	13	8.8	3	2.0	29	19.6
Black, non-Hisp	0	0.0	1	8.8	0	0.0	0	0.0	1	8.8
Other	5	10.5	0	0.0	2	4.2	3	6.3	10	21.1
Age group										
<20	3	42.0	0	0.0	3	42.0	1	14.0	7	97.9
20-24	5	9.4	4	7.6	5	9.4	0	0.0	14	26.4
25-29	3	5.5	0	0.0	2	3.7	3	5.5	8	14.7
30-34	2	5.7	0	0.0	2	5.7	0	0.0	4	11.5
35-39	1	3.9	0	0.0	1	3.9	0	0.0	2	7.8
40-44	1	5.5	0	0.0	2	10.9	2	10.9	5	27.3
45+	.	.	.	.	.	.	.	.	.	.
Military status										
Enlisted	12	7.2	4	2.4	13	7.8	4	2.4	33	19.9
Officer	3	7.3	0	0.0	2	4.9	2	4.9	7	17.1
Cold year (Jul-Jun)										
2006-2007	7	17.5	0	0.0	5	12.5	3	7.5	15	37.4
2007-2008	2	4.9	0	0.0	1	2.4	0	0.0	3	7.3
2008-2009	1	2.4	2	4.8	4	9.6	2	4.8	9	21.6
2009-2010	1	2.4	1	2.4	3	7.1	0	0.0	5	11.8
2010-2011	4	9.6	1	2.4	2	4.8	1	2.4	8	19.2

<sup>a</sup>Rate per 100,000 person-years

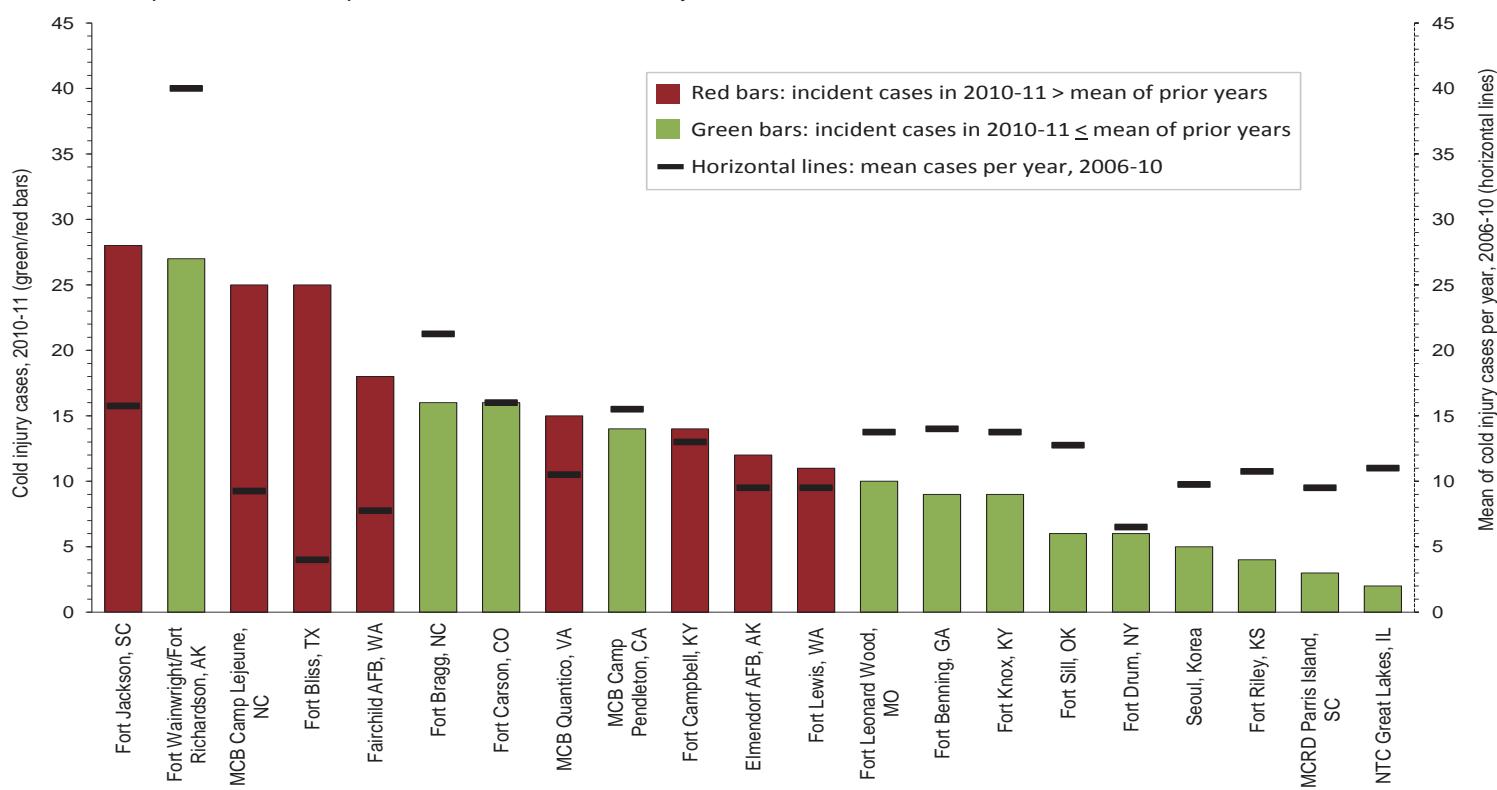
<sup>b</sup>One of each type of cold injury per individual per year

each of 21 locations worldwide. Of these locations, eight had more (and 13 had fewer) cold injuries in 2010-11 than the average of cold injury episodes per year during the prior four years at the respective locations (**Figure 3**). In the past year, Fort Jackson, SC (n=28), Forts Wainwright and Richardson in Alaska (n=27), Marine Corps Base Camp LeJeune, NC (n=25) and Fort Bliss, TX (n=25) had more than 20 cold injury cases each among active and reserve component members (**Figure 3**).

#### EDITORIAL COMMENT

In general, during the past cold season, numbers, rates, and types of cold injuries among U.S. service members were similar to those in recent years. The finding should be interpreted in light of the unusual severity of the winter of 2010-11 in many parts of the eastern United States and Europe. As in the past, rates of cold injuries overall remain higher in the Army and Marine Corps than in the Air Force,

**FIGURE 3.** Annual number of cold injuries<sup>a</sup>, 2010-11 and mean during 2006-2010, at locations with at least 30 cold injuries during the surveillance period, active component, U.S. Armed Forces, July 2006-June 2011



<sup>a</sup>One cold injury per individual per year

Navy, and Coast Guard. In the Marine Corps, the rate of cold injuries overall was higher during the past cold season than the previous four cold seasons. Compared to the prior season, in 2010-11, rates were similar in the Army, Air Force and Coast Guard and declined in the Navy.

Comparisons of cold injury experiences among the Services should be done carefully if at all. For example, differences across services in cold injury rates – overall, by type, and in relation to the military characteristics of those most affected – reflect differences in the natures, locations, and circumstances of the training and operations of the Services. Also, differences in rates across services may reflect differences in the ascertainment and/or reporting of cold injury cases (e.g., records of medical encounters during field exercises, deployment operations, and aboard Navy ships are not routinely available for health surveillance purposes). In general, among service members overall, the youngest aged, female, enlisted, and black non-Hispanic service members have

relatively high rates of cold injuries—particularly frostbite. Other reports have documented that African American soldiers and soldiers with prior cold injuries have increased susceptibilities to cold injuries during prolonged or intense cold exposures.<sup>2,3</sup> Special vigilance by individuals, line supervisors, commanders, and medical staff is indicated to prevent cold injuries among those with known or suspected increased susceptibilities.

Commanders and supervisors at all levels should implement appropriate countermeasures to prevent cold injuries, including proper clothing and equipment, wind chill temperature monitoring and awareness training.<sup>1,4</sup> Service members who train in wet and freezing conditions should know the signs of cold injury, obtain adequate hydration, and avoid tobacco, caffeine, and vasoconstrictive medications.<sup>1,4,6</sup> Up-to-date cold injury prevention materials (including posters, presentation outlines, policies, regulations, and technical bulletins) are available

online: <http://phc.amedd.army.mil/topics/discond/cip/Pages/default.aspx>

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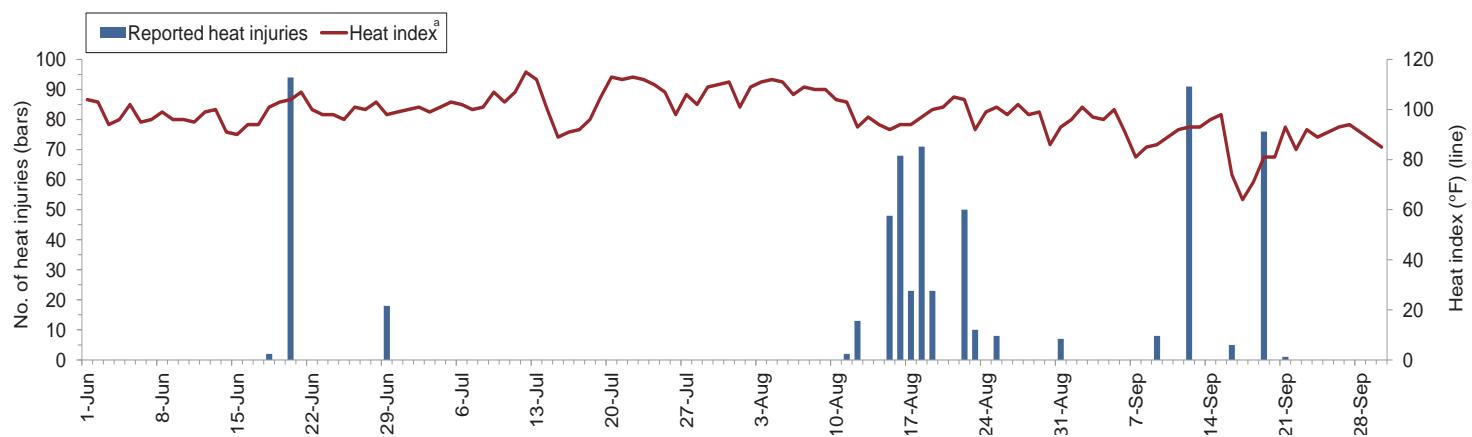
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# Surveillance Snapshot: Reportable Medical Events of Heat Injury in Relation to Heat Index, June-September 2011

In the U.S. military, notifiable heat injuries include heat stroke and other moderate to severe heat-related injuries that require medical intervention or result in lost duty time. During June through September of 2011, 1,265 heat injuries among active and reserve component members were reported from 46 U.S. military installations worldwide. Of these, nearly one-half ( $n=618$ ) were reported from one large training installation in the southeastern United States; and at this installation, 80 percent ( $n=498$ ) were reported on just 7 days with at least 48 cases each day.

Clusters of heat injuries at this installation were reported during periods of increasing heat stress (e.g. heat index), though not on the days with the highest measurements of heat index. There were no heat injuries associated with the 25 days when the heat index was 105 or greater. Eighty-six percent ( $n=529$ ) of the heat injuries were associated with heat index readings between 90 and 104.

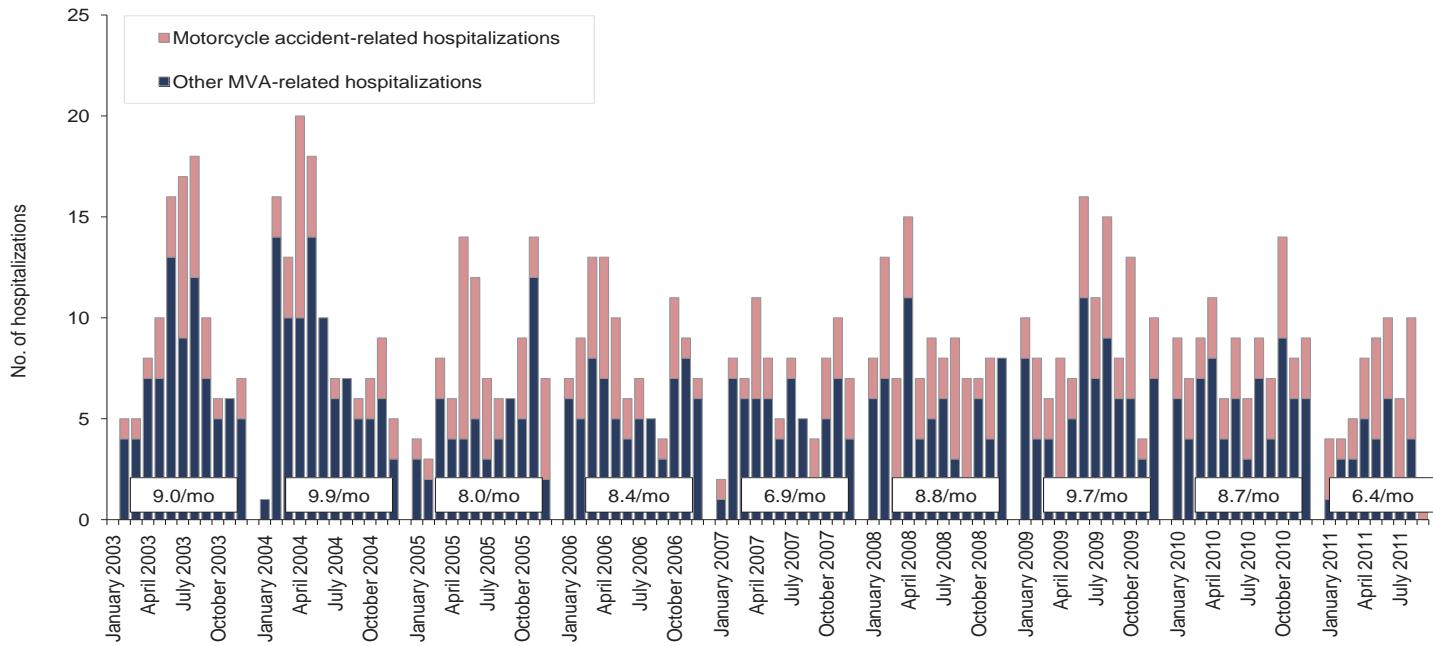
Notifiable heat injuries reported from a single training installation in the southeastern United States ( $n=380$ ) and heat index at that installation, by day, 1 June - 30 September 2011



<sup>a</sup>Based on National Weather Service data

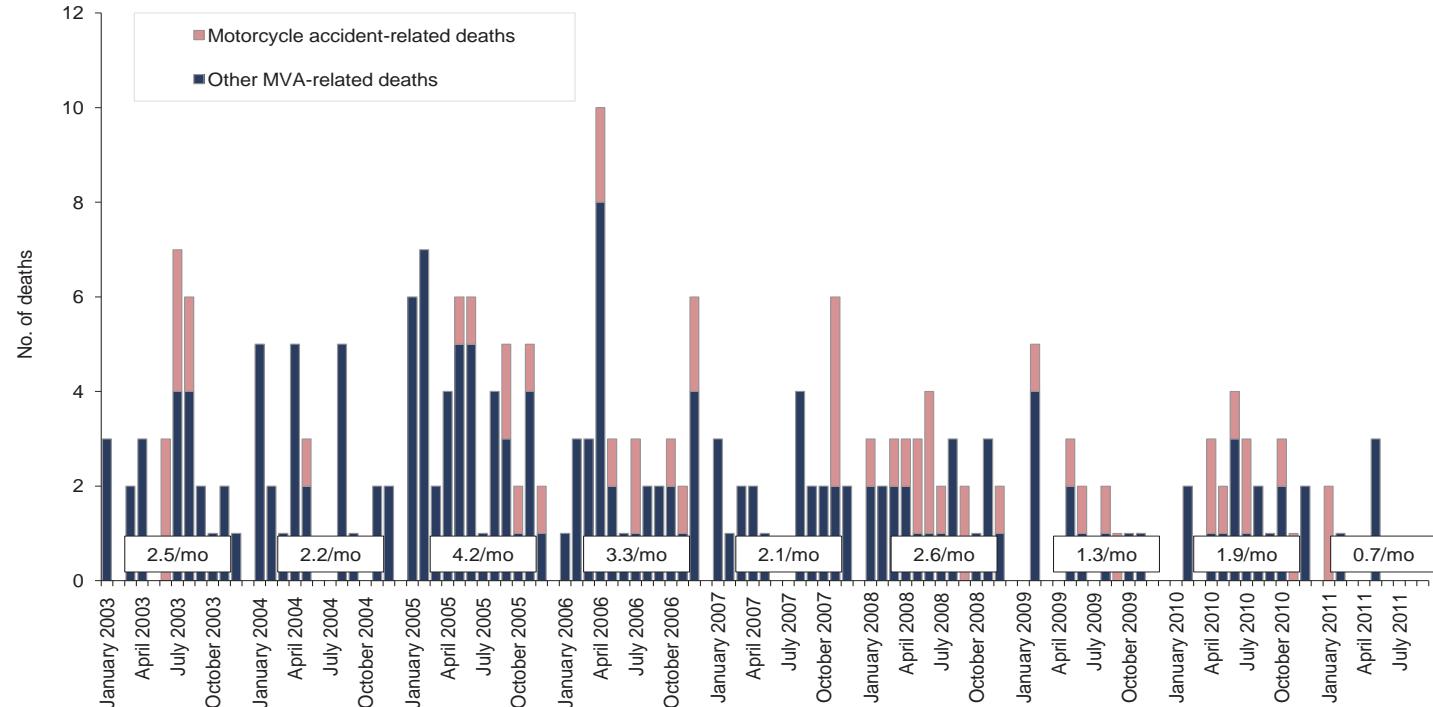
# Deployment-related conditions of special surveillance interest, U.S. Armed Forces, by month and service, January 2003 - September 2011 (data as of 27 October 2011)

Motor vehicle accident-related hospitalizations (outside of the operational theater) (ICD-9-CM: E810-E825; NATO Standard Agreement 2050 (STANAG): 100-106, 107-109, 120-126, 127-129)



Note: Hospitalization (one per individual) while deployed to/within 90 days of returning from OEF/OIF/OND. Excludes accidents involving military-owned/special use motor vehicles. Excludes individuals medically evacuated from CENTCOM and/or hospitalized in Landstuhl, Germany within 10 days of a motor vehicle accident-related hospitalization.

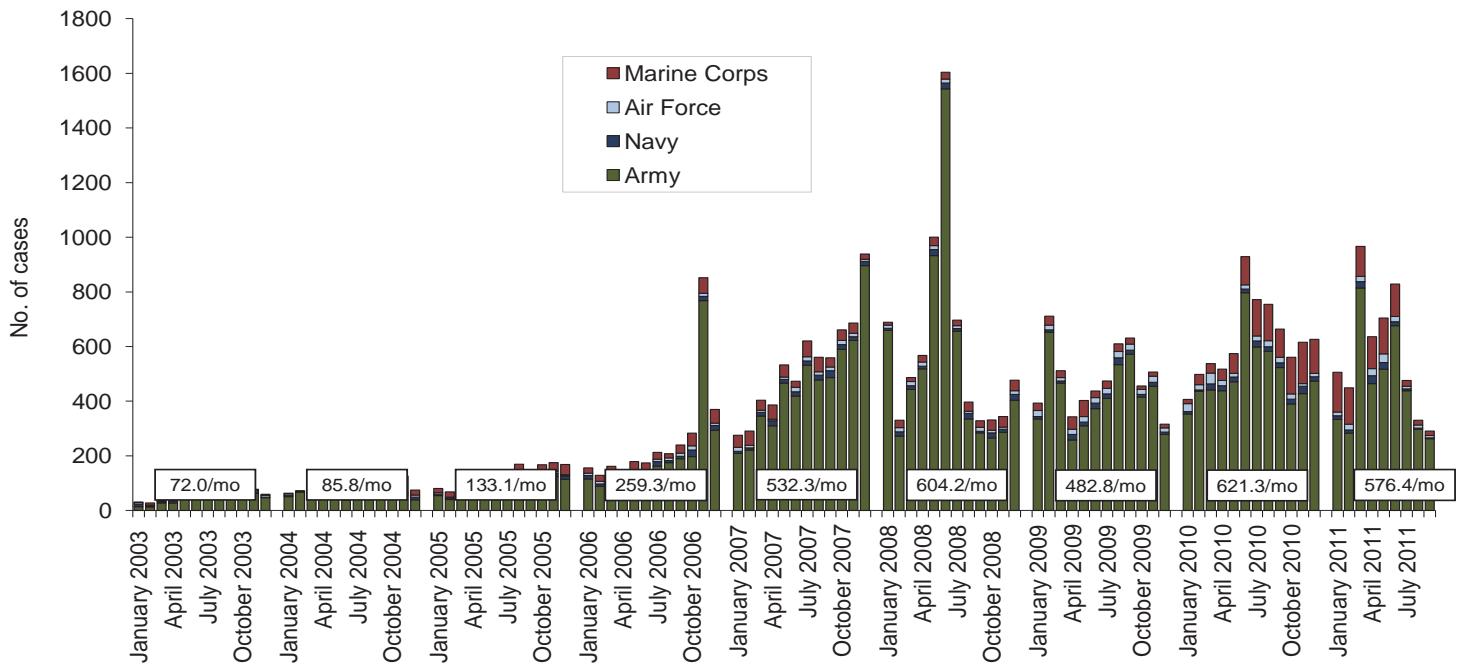
Motor vehicle accident-related deaths (outside of the operational theater) (per the DoD Medical Mortality Registry)



Reference: Armed Forces Health Surveillance Center. Motor vehicle-related deaths, U.S. Armed Forces, 2010. *Medical Surveillance Monthly Report (MSMR)*. Mar 11;17(3):2-6.  
Note: Death while deployed to/within 90 days of returning from OEF/OIF/OND. Excludes accidents involving military-owned/special use motor vehicles. Excludes individuals medically evacuated from CENTCOM and/or hospitalized in Landstuhl, Germany within 10 days prior to death.

## Deployment-related conditions of special surveillance interest, U.S. Armed Forces, by month and service, January 2003 -September 2011 (data as of 27 October 2011)

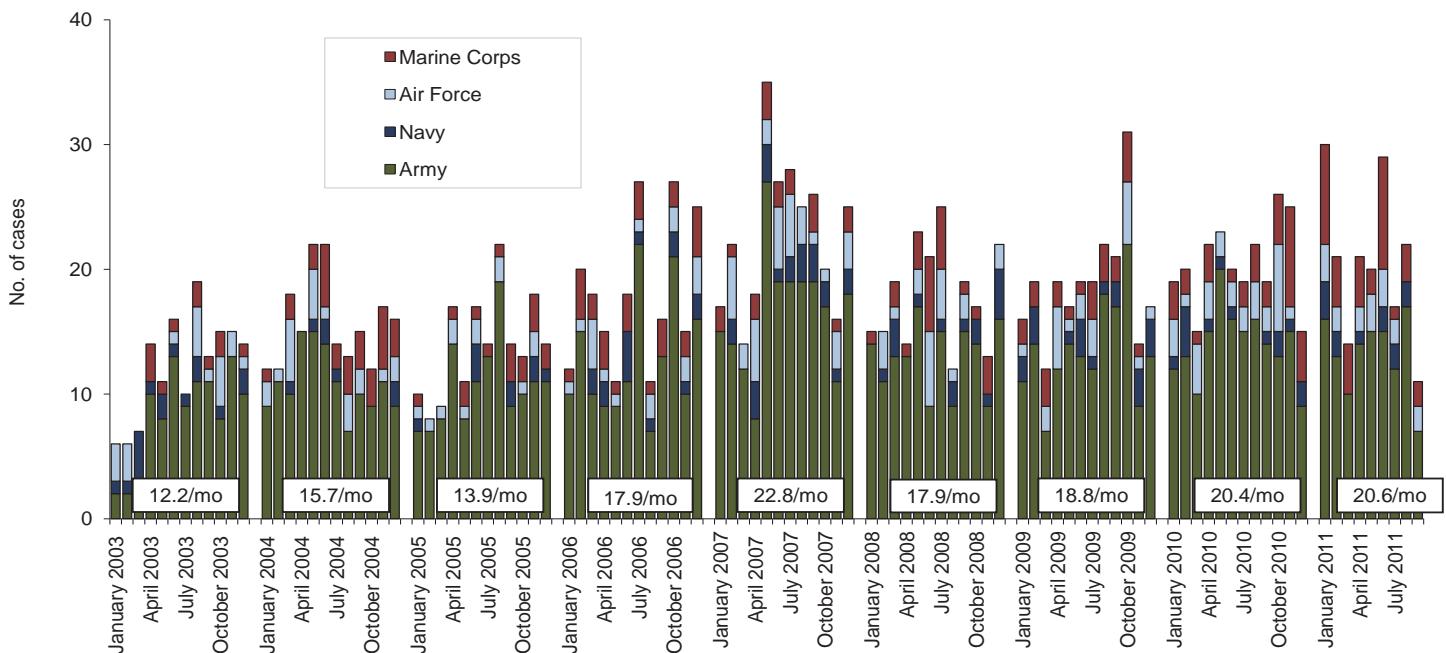
Traumatic brain injury (ICD-9: 310.2, 800-801, 803-804, 850-854, 907.0, 950.1-950.3, 959.01, V15.5\_1-9, V15.5\_A-F, V15.52\_0-9, V15.52\_A-F, V15.59\_1-9, V15.59\_A-F)<sup>a</sup>



Reference: Armed Forces Health Surveillance Center. Deriving case counts from medical encounter data: considerations when interpreting health surveillance reports. MSMR. Dec 2009; 16(12):2-8.

<sup>a</sup>Indicator diagnosis (one per individual) during a hospitalization or ambulatory visit while deployed to/within 30 days of returning from OEF/OIF. (Includes in-theater medical encounters from the Theater Medical Data Store [TMDS] and excludes 3,261 deployers who had at least one TBI-related medical encounter any time prior to OEF/OIF).

Deep vein thrombophlebitis/pulmonary embolus (ICD-9: 415.1, 451.1, 451.81, 451.83, 451.89, 453.2, 453.40 - 453.42 and 453.8)<sup>b</sup>

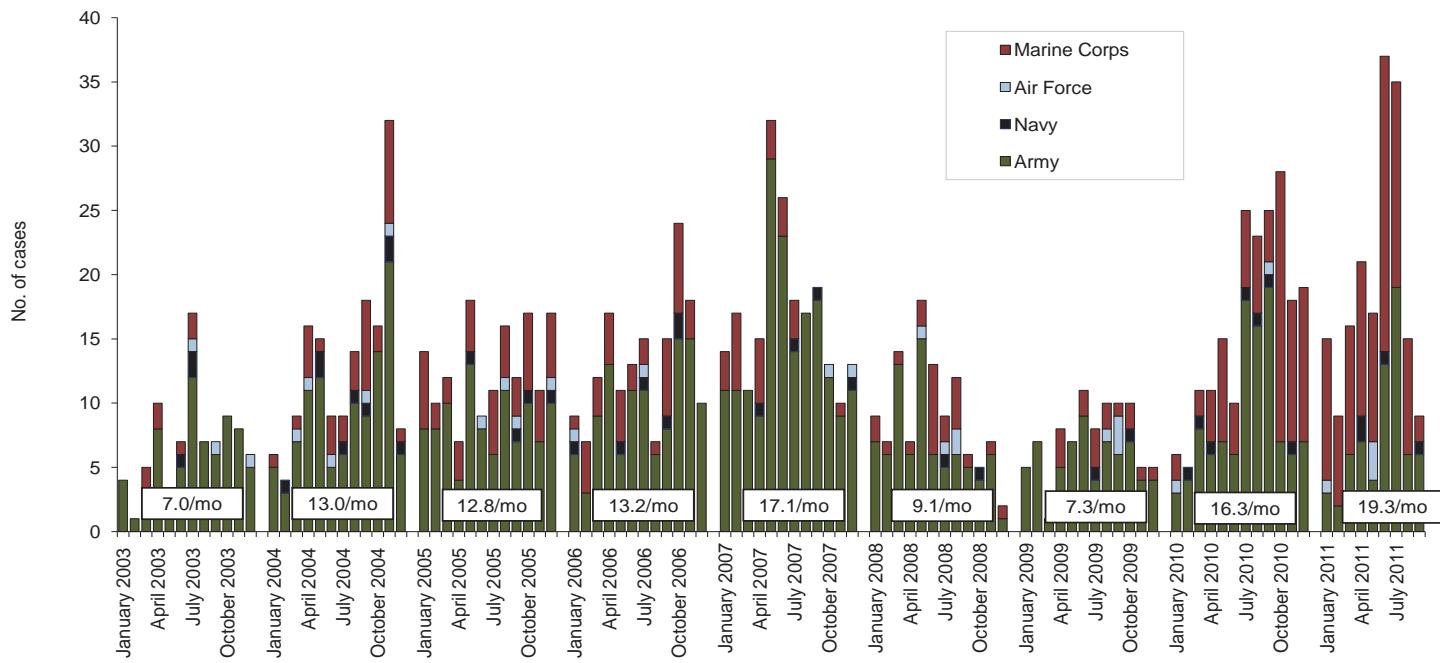


Reference: Isenbarger DW, Atwood JE, Scott PT, et al. Venous thromboembolism among United States soldiers deployed to Southwest Asia. *Thromb Res.* 2006;117(4):379-83.

<sup>b</sup>One diagnosis during a hospitalization or two or more ambulatory visits at least 7 days apart (one case per individual) while deployed to/within 90 days of returning from OEF/OIF.

# Deployment-related conditions of special surveillance interest, U.S. Armed Forces, by month and service, January 2003 - September 2011 (data as of 27 October 2011)

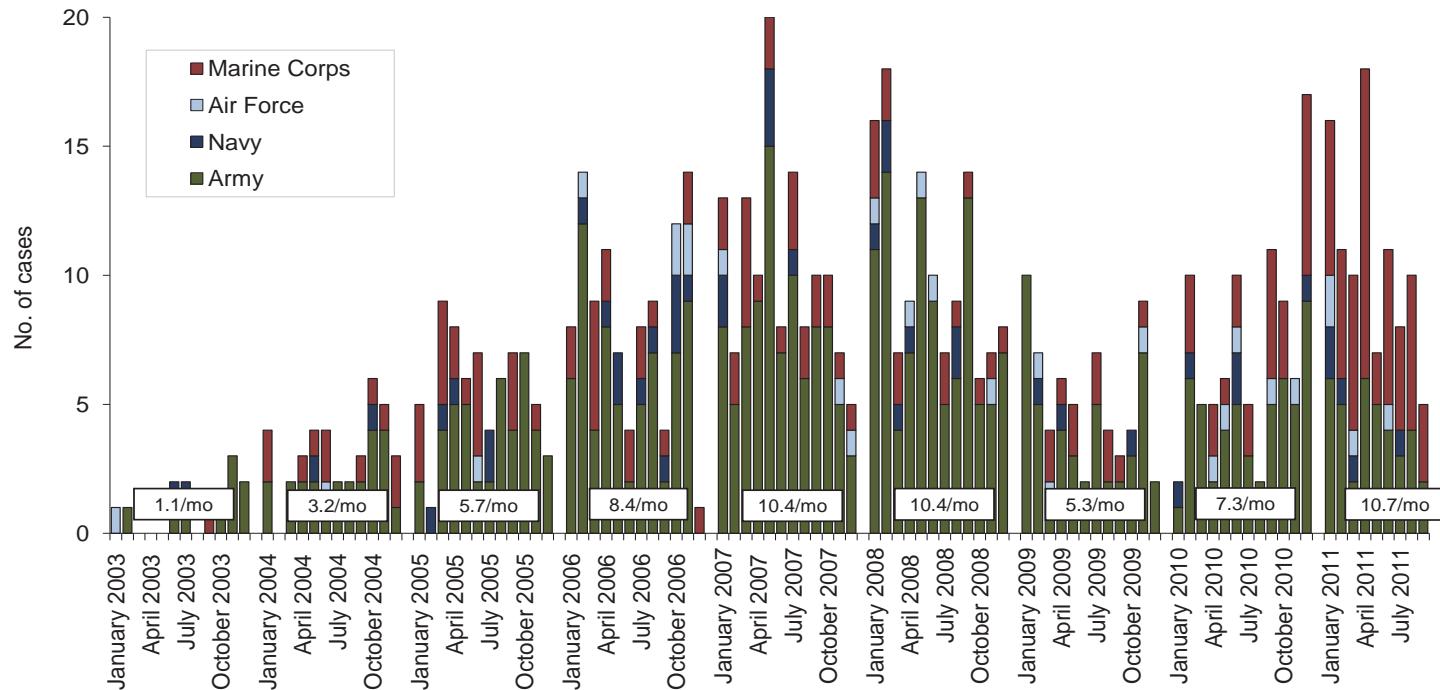
Amputations (ICD-9-CM: 887, 896, 897, V49.6 except V49.61-V49.62, V49.7 except V49.71-V49.72, PR 84.0-PR 84.1, except PR 84.01-PR 84.02 and PR 84.11)<sup>a</sup>



Reference: Army Medical Surveillance Activity. Deployment-related condition of special surveillance interest: amputations. Amputations of lower and upper extremities, U.S. Armed Forces, 1990-2004. *MSMR*. Jan 2005;11(1):2-6.

<sup>a</sup>Indicator diagnosis (one per individual) during a hospitalization while deployed to/within 365 days of returning from OEF/OIF.

## Heterotopic ossification (ICD-9: 728.12, 728.13, 728.19)<sup>b</sup>

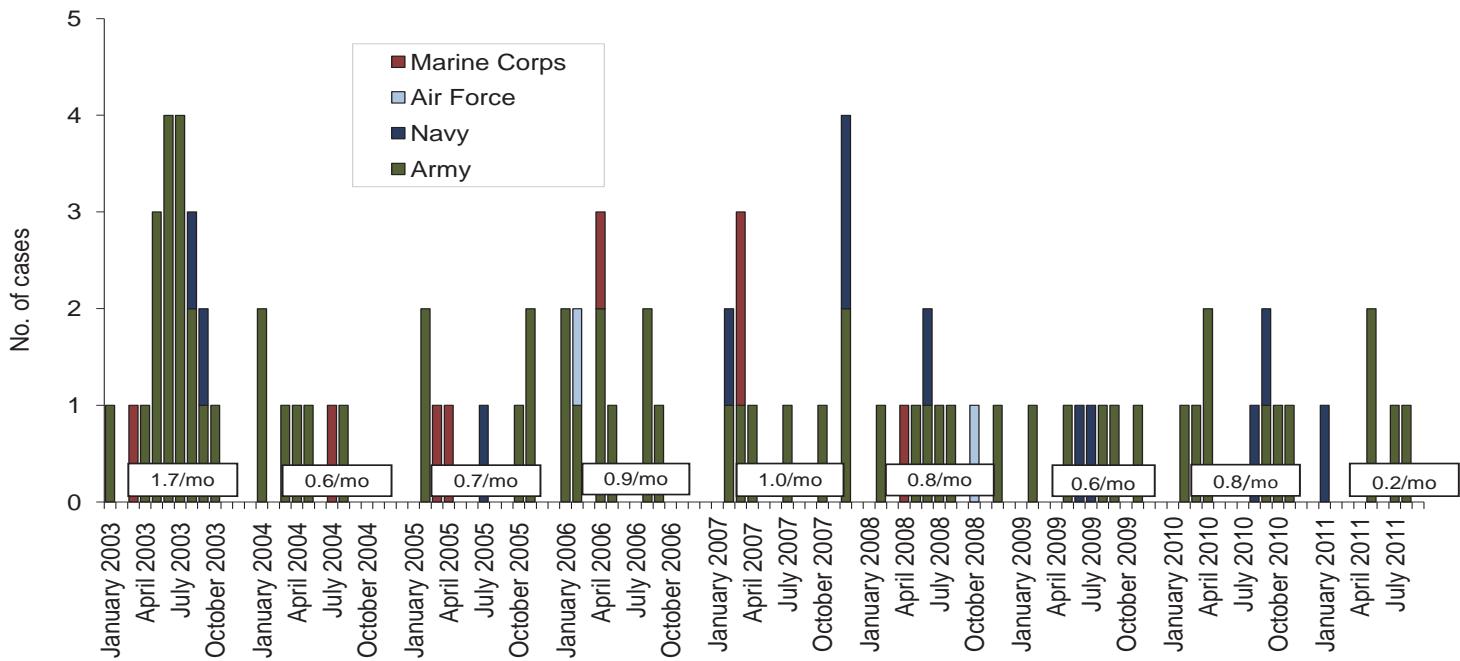


Reference: Army Medical Surveillance Activity. Heterotopic ossification, active components, U.S. Armed Forces, 2002-2007. *MSMR*. Aug 2007; 14(5):7-9.

<sup>b</sup>One diagnosis during a hospitalization or two or more ambulatory visits at least 7 days apart (one case per individual) while deployed to/within 365 days of returning from OEF/OIF.

## Deployment-related conditions of special surveillance interest, U.S. Armed Forces, by month and service, January 2003 - September 2011 (data as of 27 October 2011)

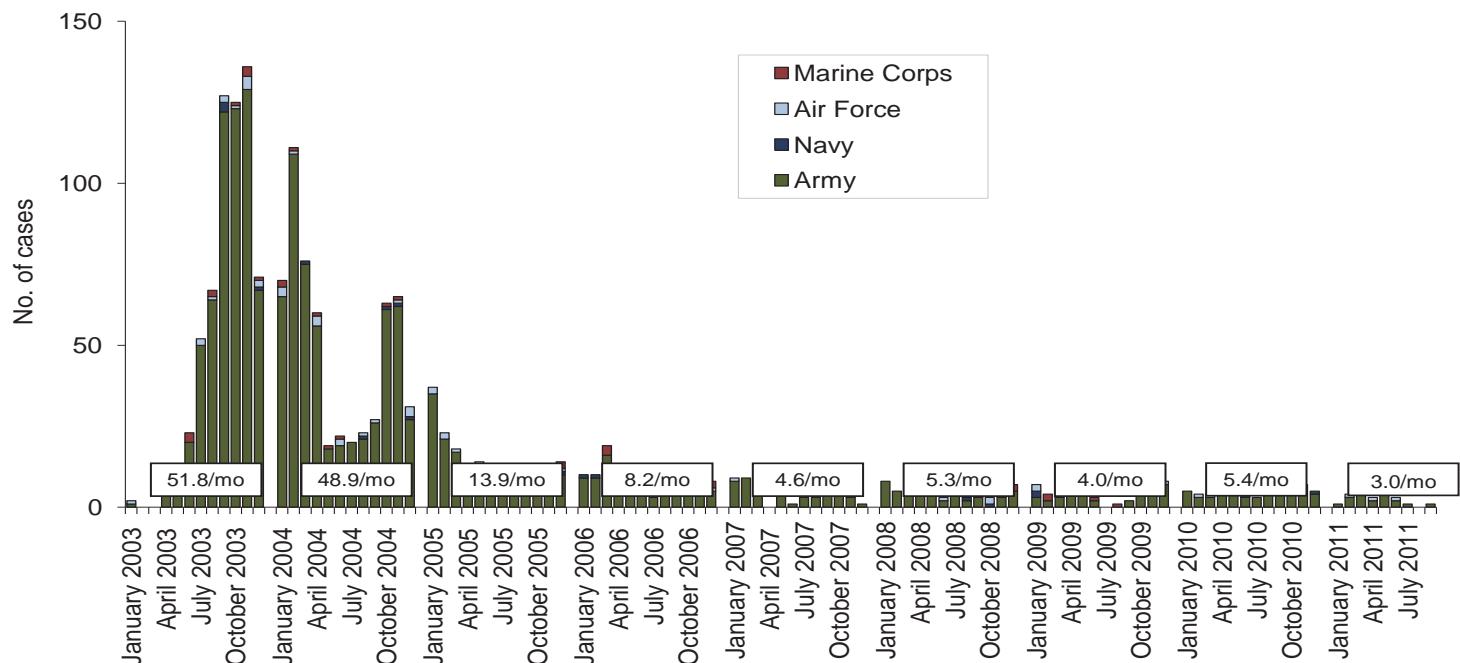
Severe acute pneumonia (ICD-9: 518.81, 518.82, 480-487, 786.09)<sup>a</sup>



Reference: Army Medical Surveillance Activity. Deployment-related condition of special surveillance interest: severe acute pneumonia. Hospitalizations for acute respiratory failure (ARF)/acute respiratory distress syndrome (ARDS) among participants in Operation Enduring Freedom/Operation Iraqi Freedom, active components, U.S. Armed Forces, January 2003-November 2004. *MSMR*. Nov/Dec 2004;10(6):6-7.

<sup>a</sup>Indicator diagnosis (one per individual) during a hospitalization while deployed to/within 30 days of returning from OEF/OIF.

Leishmaniasis (ICD-9: 085.0 to 085.9)<sup>b</sup>



Reference: Army Medical Surveillance Activity. Deployment-related condition of special surveillance interest: leishmaniasis. Leishmaniasis among U.S. Armed Forces, January 2003-November 2004. *MSMR*. Nov/Dec 2004;10(6):2-4.

<sup>b</sup>Indicator diagnosis (one per individual) during a hospitalization, ambulatory visit, and/or from a notifiable medical event during/after service in OEF/OIF.

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